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REPORT

OF

THE COMMISSION

ON THE

HEATING, LIGHTING, AND VENTILATION

OF THE

SOUTH KENSINGTON MUSEUM:

TOGETHER WITH

MINUTES OF EVIDENCE AND APPENDIX.

Presented to both Houses of Parliament by Command of Her Majesty.



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## CONTENTS.

	PAGE
REPORT	i
LIST OF WITNESSES	1
MINUTES OF EVIDENCE	ib.
CONTENTS OF APPENDIX	76
APPENDIX	78



## REPORT

OF THE

### COMMISSION ON THE HEATING, LIGHTING, AND VENTILATION OF THE SOUTH KENSINGTON MUSEUM.\*

I. The instructions given to us by the Lords of the Committee of Council on Education were, "to report upon the system adopted for heating and ventilating the South Kensington Museum, and especially to consider whether any injurious effects have arisen to any of the works of art contained in the museum from the plan of heating by means of hot-water pipes. Also to consider the report made on the 20th of July 1859, by Professors Faraday, Hofmann, and Tyndall, Mr. Redgrave, R.A., and Captain Fowke, R.E., and report what further precautions, if any, it is necessary to adopt."

Instructions to report.

II. Their Lordships were also further pleased to confer upon us the power to call for any reports relating to the subject under consideration, which had been registered in the Science and Art Department, and to examine any of the Department's officers.

III. In accordance with these instructions we have taken the evidence *vivæ voce* of various witnesses to the number of seven, and have had before us various statistics and documentary evidence, all of which are given in the appendix to this Report. We have also carefully examined the South Kensington Museum, and the methods of heating, lighting, and ventilating it, and we have visited the National Gallery and the British Museum with a view of seeing the arrangements there made for similar purposes.

Proceedings of Commission.

We have now to report as follows :

IV. LIGHTING.—As respects lighting, the Commission of 1859, composed of the members whose names are given above, reported that—

REPORT.

" There is nothing innate in coal gas which renders its application to the illumination of picture galleries objectionable. Its light, though not so white as that of the sun, is equally harmless; its radiant heat

Report of previous Commission of 1859.

\* Plans of the courts and galleries of the Museum, shewing their respective dimensions and relative position, will be found in the annual reports of the Science and Art Department.

" may be rendered innocuous by placing a sufficient distance between  
" the gas jets and the pictures, while the heat of combustion may be  
" rendered eminently serviceable in promoting ventilation.

" Coal gas may be free from sulphuretted hydrogen compounds, and  
" in London is so at the present time; it then has little or no direct  
" action on pictures. But it has not as yet been cleansed from sulphide  
" of carbon, which, on combustion, yields sulphurous acid gas capable  
" of producing  $22\frac{1}{2}$  grains of sulphuric acid per 100 cubic feet of present  
" London coal gas.\* It is not safe to permit this product of the com-  
" bustion to come in contact with pictures, painted either in oil or water  
" colours; and the Commission are emphatically of opinion that in  
" every system of permanent gas lighting for picture or sculpture  
" galleries, provision should be made for the effectual exclusion or with-  
" drawal of the products of combustion from the chambers containing  
" the works of art.

" The Commission have examined the Sheepshanks Gallery as an  
" experimental attempt to light pictures with gas, and are of opinion  
" that the process there carried out fulfils the condition of effectually  
" illuminating the pictures and at the same time removing the products  
" of combustion. According to the indications of the thermometer  
" required and obtained, it does this in harmony with, and in aid of, the  
" ventilation, and does not make a difference of more than one degree  
" Fahrenheit at the parts where the pictures are placed between the  
" temperatures before and after the gas is lighted."

Correspond-  
ence confirma-  
tory of Report.

V. This report was further confirmed by letters written by Professors Faraday, Tyndall, and Hofmann in 1861, and by Dr. Frankland and Professor Hofmann in 1865. (See Appendix, p. 89.) In February 1868 Dr. Frankland analyzed the gas supplied to the South Kensington Museum. From his analysis (see Appendix, p. 91) it appears that the South Kensington Museum is situated in the district which is supplied by the only company whose gas, at the time of his report, did not contain an excessive amount of sulphur.

VI. We see no reason to differ from the conclusions arrived at in these reports, and we are of opinion that in the picture galleries the pictures are not exposed to the products of combustion, and cannot suffer any appreciable injury from the effects of the lighting of these rooms. In the courts and in the galleries generally the gas is so placed, whether close below louvres in the roof, or in sun-burners, or outside the windows, as, we believe, effectually to remove the products of combustion.

VII. There are, however, some places in the corridors and side galleries and cloisters where naked gas lights are employed without immediate and separate communication with the exterior; the products of their combustion have consequently to be carried off by the general ven-

\* Hofmann.

tilation of the museum, and may to some slight extent find their way into the picture galleries. For these lights we think it would be advisable to substitute, as soon as possible others, such as sun-burners, with special means for removing the products of combustion before they can become mixed with the general atmosphere of the museum.

VIII. VENTILATION.—As respects the ventilation of the museum and galleries, while we should hesitate to say that the present system is incapable of improvement, we believe it to be on the whole highly satisfactory and efficient.

IX. HEATING.—As respects the system of warming with hot-water pipes, we are of opinion that under the circumstances, and for the purposes of museums and picture galleries, it is the best that has been devised up to the present time. It is good as respects the ventilation, it is thoroughly under control, and, as will be seen on reference to the appendices B. & G., pp. 79 and 99, by its means an equable temperature is maintained in winter by day and night.

X. Various objections to the lighting and heating of the museum have been taken by several witnesses, to whose opinion on art matters we would wish to give all due weight. We think, however, that an examination of their evidence on the more purely physical points of the subject will show that their opinions on this question of warming and ventilation are based, rather on personal sensations of heat and dryness, than on accurate instrumental observation. Such for instance are the opinions that open fireplaces in a gallery give a more equable temperature than hot-water pipes, and that the latter cause no motion in the air. Currents of air which cause a sensation of coldness to the human body are assumed to have the same effect on pictures and to "chill" *them*, though these currents do not affect the thermometers in the room. It has also been stated that 60° Fahrenheit is too high a temperature for pictures; that certain galleries are maintained, without artificial means of cooling, at a temperature 20° less than the external air, while that air is freely admitted, and that the temperature of these galleries in summer never rises above 67° or 68°.

XI. Exception has been taken to the system of heating the galleries on the ground of the extreme dryness of the atmosphere thereby engendered. In the absence of direct

Objections of  
witnesses to  
present method  
of lighting and  
heating.

Dryness of  
atmosphere.

evidence from experiment to the contrary, we should be inclined to think that a dry atmosphere was the most conducive to the preservation of pictures, whether in oil, tempera, or water colours, and of works of art in general. But we do not find from the indications of the hygrometer that the air in the museum is rendered excessively dry by the method of heating. Details on these points are given in the tables in the Appendix (p. 99) and in Capt. Festing's memorandum, p. 79. It may be stated generally that the greatest artificial dryness produced, when the galleries are warmed in winter, is not greater than the natural dryness that often obtains in summer. The greatest artificial dryness noted was about 45 of saturation.

Position of hot-water pipes.

XII. The position of the hot-water pipes is a doubtful question. In the Raphael cartoon gallery and in the new picture galleries the hot-water pipes are near the centre of the room. In the galleries first erected on the west side of the courts, some of which are temporary, the pipes are close to the walls and under the pictures. A shelf intervenes in most of the rooms between the pipes and the pictures, and shields them from the direct radiation of heat. It appears, moreover, from the indications of thermometers hung in succession a foot apart above the pipes, that the heat at the level of the bottom of the pictures is not more than one or two degrees above the general temperature of the room. Still, we are willing to defer to the opinion expressed by some of the witnesses that it is advisable to have the pipes in the middle of the galleries.

Deterioration of pictures by cracking, etc.

XIII. Some of the pictures at South Kensington are very much cracked, others slightly so, while many are perfectly sound; but there is nothing to show that they are in a worse state than they would have been if hung anywhere else. An examination of the photographs of several pictures, and of the cartoons, taken when they were first brought to South Kensington, does not show that they are in any worse condition than when they came. It is a matter of common observation, that certain pictures, depending apparently on the pigments, or vehicles, or varnish used, or on the method of painting, deteriorate rapidly, whether they are placed in public or private galleries, however much care may be bestowed on them. As far as we are enabled to judge from the evidence, it is such pictures that are found to be cracked in the galleries at South Kensington, and which came there more or less in

that state. For the reasons why certain pictures crack and others do not, we would refer to the evidence of Dr. David Price, p. 61, and of Mr. Boxall, R.A., Director of the National Gallery, p. 69, and to a memorandum by him and Mr. Redgrave, R.A., Appendix, p. 78.

XIV. We are unwilling to quit this portion of the subject without pointing out how little is apparently known, with any degree of certainty, of the effects of light, air, and temperature on the various pigments, vehicles, and varnishes used by painters, and of the effect of these substances on one another. More accurate knowledge on these subjects is of the very first importance. We would, therefore, strongly recommend, as indeed was done by Mr. Faraday and the other Commissioners in 1859, that a careful series of experiments should be undertaken with reference to these points.

Desirability of further investigation.

XV. Pictures and works of art in a public museum have the great advantage of constant care and attention, but a certain amount of wear and tear is inseparable from their exhibition to millions of people. It is a question how far works of art are to be open to public view. But assuming that they ought to be exhibited to the fullest extent, all that can be reasonably demanded is, that that wear and tear shall be reduced to a minimum. We believe, as stated by Mr. Boxall, that every reasonable precaution is taken for the preservation of the pictures.

Inevitable wear and tear of pictures in public galleries.

XVI. We think it right to state that we are unanimous on all the points on which we have been called upon to report, and though the Commission has since the commencement of the inquiry lost the services of that eminent chemist, Mr. Graham, the late Master of the Mint, we believe we are justified in saying that had he lived he would have concurred in our conclusions.

(Signed)

JOHN TYNDALL.

JOHN PERCY.

E. FRANKLAND.

HENRY Y. D. SCOTT,

Lieut.-Col., R.E.

J. F. D. DONNELLY,

Capt., R.E., and Secretary.

MINUTES OF EVIDENCE.

MINUTES OF EVIDENCE.

### LIST OF WITNESSES EXAMINED.

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	PAGE
Boxall, William, Esq., R.A. -	- 69
Buttery, Mr. C. -	- 36
Cox, Mr. Wm. -	- 45
Price, Dr. David S., F.C.S. -	- 61
Ridley, Sir Matthew White, Bart. -	- 13
Robinson, J. C., Esq., F.S.A. -	- 1
Wornum, Ralph N., Esq. -	- 30

MINUTES OF EVIDENCE  
TAKEN BEFORE  
THE COMMISSION  
ON THE  
HEATING, LIGHTING, AND VENTILATION  
OF THE  
SOUTH KENSINGTON MUSEUM.

South Kensington Museum, 3rd July 1865.

PRESENT :

THE MASTER OF THE MINT IN THE CHAIR.

PROFESSOR TYNDALL, F.R.S.

DR. FRANKLAND, F.R.S.

LIEUT.-COLONEL SCOTT, R.E.

CAPTAIN DONNELLY, R.E. (Secretary).

J. C. ROBINSON, Esq., F.S.A., Art Referee of the South Kensington Museum, examined. *J. C. Robinson, Esq.*

3 July 1865.

1. What office do you hold in the Science and Art Department?—I am an art referee of the Museum.

2. What are the duties of art referee?—There are two art referees, one whose duties relate to all works of art within the categories of the Museum, both of the ancient and modern periods, other than pictures and drawings dating after 1750; this is my province. Modern pictures and drawings are assigned to another referee.

3. There is a technical term "distemper." Will you state what you mean by the expression "distemper colours on paper?" (See App., p. 81.)—The term "distemper" is most frequently used to designate a certain kind of water-colour painting. Distemper painting is executed with colours in a state of dry powder mixed with some glutinous vehicle, such as size, gum, or white of egg.

4. Then all water-colour paintings are distemper?—In one sense they may be so termed; but, practically, a distinction is made. Ordinary watercolours are transparent, and are applied as thin washes or stains, having no appreciable substance or "body," whereas distemper painting, or, as the vehicle is often called, "body colour," is supposed to have a certain amount of thickness or "body," and the colours are necessarily opaque. The same description of colours are used in distemper as in oil painting; but in the former they are brought to a fluid state for use by being mixed with water and gummy substances, or animal size, and in the latter method with oil and resinous varnishes.

5. Is it quite accurately known what was the vehicle used in the Raffaelle cartoons?—I think not. It was most probably parchment size or glue; but I do not think anyone can tell what actual vehicle was used. The cartoons are painted very thinly, and that is, I think, one reason why these cartoons of Raffaelle are better preserved than those

*J. C. Robinson, of Mantegna, which have also for so long a period been preserved at Hampton Court.*  
*Esq.*

3 July 1865.

6. Have you formed any opinion as to what the pigments themselves are composed of—whether they are organic or inorganic pigments?—Doubtless both kinds were employed. The common ochres are used; and I have no doubt also some vegetable colours. I think I have observed tints of lake or purple, which are probably of organic substance. The colour most important to regard as to its liability to change, is the opaque white. My impression is that the white used in the cartoons is not the usual lead white, but rather a white earth of some kind.

7. Sulphate of baryta do you suppose?—I scarcely think barytes was known as a pigment at that time. I have observed no indication of blackening in the white pigments. If the white had been from a lead base, I think in some part or other there would have been indications of change. The action of white lead in regard to change of colour is very capricious. I have seen ancient drawings in which the lead whites are perfectly preserved after 300 or 400 years' exposure, while in others of quite recent origin, this pigment has become of an intense metallic black colour; the vehicle used goes for a great deal. You can "lock up" white lead in such a manner as to make it practically permanent. Damp and noxious effluvia would act upon white lead in a distemper vehicle; and had the white in the cartoons been white lead, I apprehend they would, at all events in parts, have changed before this. Oil and varnish, on the other hand, protect lead white and other changeable pigments immensely; in technical language, it is said to "lock" them up, and in reality the oily vehicle or envelope prevents the action of the peculiar atmospheric influences which might induce chemical change in the pigment itself. As I said before, however, the action of the lead pigment is most uncertain; and, after all, it is by no means improbable that the white employed in the cartoons *is* lead white, in which case its immunity from change may have been owing to some peculiar protective quality in the distemper vehicle. If any permanent white pigments have in this instance been used instead of lead, I think it should be regarded as rather a remarkable instance of deviation from the ordinary practice of the period, which was to make free use of white lead, although with full knowledge of its liability to discolouration. I apprehend, however, that the cartoon whites might easily be tested by chemical means; and I think it would be most desirable to ascertain by experiment what is their actual constitution.

8. In paragraph 3 of your report (see App., p. 91) you state "there is a minimum of light at Hampton Court; this has caused the "pictures to become dark, whilst, on the other hand, it has tended to "prevent the fading of the cartoons"?—Yes; I have no doubt that is so.

9. Is your opinion based on an examination of the pictures?—Yes; I have observed at Hampton Court that the oil pictures are unusually dark; and, on the other hand, that the cartoons are comparatively well preserved.

10. I dare say you are quite correct as to the fact; but we wish, if possible, to know the reason why the oil pictures are so black. Is it your impression that it is attributable to the absence of light?—I believe it to be partly so. For instance, if pictures are hung for any length of time upon the walls of a room painted in oil, say of the usual light green colour, after a time, if the pictures are taken down, you will find there are dark patches where they have hung, and where the light has not had access to the wall. The reason is that the oil in the wall paint has darkened.

11. Are you sure that the darkening is attributable to the absence of light?—That is my impression at present, certainly. I know for a fact that light bleaches the oil with which pictures are painted; and, on the other hand, that the same oil kept long in the dark itself grows darker; I infer therefore that the absence of light causes oil pictures to become darkened.

*J. C. Robinson,  
Esq.*

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3 July 1865.

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12. You state that as your own belief?—Yes; quite so. Pictures which are deprived of light become more opaque and dark than those which are exposed to the light. This observation applies, of course, particularly to oil pictures.

13. Do I understand you to say the pigments are not affected?—Not materially; it is, I conceive, the enveloping vehicle that is mainly affected. The Committee would, I think, be able to get some information on this subject from Sir Charles Eastlake's excellent book, "Materials for a History of Oil Painting."

14. You would not say that it is directly upon the pigments of the cartoons that the light acts?—On the contrary; in their case it is the pigment and not the vehicle which is affected. I do not think either size or glue or gums would darken from the action of light; but, on the other hand, some of the pigments would fade or become lighter; the same pigments in a distemper medium would, I think, fade more rapidly under the same light than they would if locked up in an oil vehicle. I am inclined to think that the colour of the oil vehicle itself, always more or less yellow or brown, may tend to lessen the bleaching properties of the light; in other words, that the light having to pass through a somewhat darkened medium before it reaches the pigments, is in a certain manner deprived of its bleaching properties.

15. What do you define as the vehicle in oil pictures?—It is usually linseed oil mixed with some resinous varnish, such as mastic or copal.

16. More or less opaque?—No; it is in its nature transparent, the more so the better; it is not, however, always colourless, and unfortunately its tendency, under ordinary conditions, is to get darker rather than lighter in tint.

17. If transparent the light would go through and get at the pigments?—In practice there is but little complaint of fading in oil pictures; that is not usually a cause of grievance, but it is in the case of drawings. The oil picture is darker in itself; the oil is of a dark colour.

18. At all events the varnish keeps the air from the surface of oil pictures?—Yes; but as I have said, I think even the light itself is less active in their case, owing to the oil and very often the superadded varnish being of a yellowish or brownish tone. I suspect there is something in that.

19. You consider distemper pictures are more liable to fade than oil paintings, even when the same pigments are used?—That is my opinion.

20. Mr. Redgrave has given his opinion that bad varnish has had a good deal to do with the pictures at Hampton Court becoming blackened?—No doubt there has been every possible bad usage and neglect; and bad oil varnishes have doubtless been extensively used in past times, the tendency of which has been to form dark crusts or films on the pictures.

21. You do not then attribute the blackening wholly to the absence of light?—I think very bad substances have been used, but in great part I do attribute it to the absence of light. At Hampton Court the rooms are very dark. The light, moreover, is admitted low down, and many of the pictures are hung close up to the ceiling above its level.

22. Why do you recommend with respect to the cartoon gallery that

*J. C. Robinson,  
Esq.*  
3 July 1865.

the light in the mornings should be excluded?—Simply because in the summer months there is a long period every morning, say from four or five o'clock till 10 a.m., when the cartoons not being under exhibition are needlessly exposed to the deteriorating influence of the light.

23. Will you favour the commission with your ideas regarding the curtailment of the periods of exhibition. What would you propose?—I am not prepared to make specific recommendations on the point. In future, as the cartoons will be exhibited in the evenings by artificial light, the time so gained might be considered as a set off as against a diminished period of exhibition by daylight. Again, it might be a question of exhibiting the cartoons only one or two days a week, or they might be covered with curtains which an attendant might be stationed to draw aside on application and replace afterwards. It is a serious question, I think, whether certain works of art should be exhibited from day to day as they now are, considering that they may, even in our own time, practically come to an end under the process. I allude especially to modern water-colour drawings; such works when exposed to full light may be actually seen from day to day in process of fading off the paper. In many of Turner's drawings some of the colours have almost vanished.

24. But have they not done their duty by giving pleasure to a great number of the public during their existence?—I can never admit that works of art of great masters should be allowed to perish from disregard of the essential conditions of their preservation, at all events during an immediately proximate period after their production.

25. Is it not fair wear and tear?—No; I think it is unreasonable and unfair usage. If there is danger that a great work of art will, under certain conditions of exposure, come to a virtual end, say in 50 years' time, and if by modifying those conditions you can, as it were, prolong the life of that work, say to 500 years, I think you are imperatively called upon to do so. At the same time I do not think the public interests, *i.e.*, as regards the exhibition of works of an evanescent nature, need necessarily suffer. If the periods of exhibition were curtailed, in all probability quite as many persons would, in the long run, see the works in question; they would come expressly to see them, and in proportion as the periods of exhibition were shortened or rendered less frequent, so much the greater would be the attention and interest shown.

26. Have you ever observed any great amount of fading in the pictures exhibited at the Crystal Palace?—The pictures there are generally speaking so unworthy of notice that I cannot say I have ever given them any special attention.

27. With regard to the Turner pictures, do you think they would have stood better if more care had been taken of them?—I think Turner's drawings have faded and otherwise changed, mainly from too much exposure to light. Turner was, I think, rather careless as to the pigments he used; he used sometimes fugitive colours, such as some of the vegetable yellows. The brilliant transparent yellows are nearly all more or less fugitive. It has frequently been the habit to make green tints of permanent blue and fugitive yellow pigments, and, in consequence, after some years, from the fading of the yellow, what were at first warm greens have become blue. This particular defect may, I think, be seen in some of Turner's drawings. Turner's delicate half tints and distances have unfortunately very often suffered, so that that which was originally most distant has sometimes become confused with or even appears nearer than the middle distance.

28. In paragraph 8 of your report you state this:—"A dry and somewhat heated atmosphere, not necessarily objectionable in the case

“ of oil pictures, is the worst possible status of distemper vehicles, *J. C. Robinson, Esq.*  
 “ and in this respect the conditions of Hampton Court as regards the  
 “ cartoons are better than those of South Kensington. At Hampton  
 “ Court the atmosphere is rather damp than dry, and this has probably  
 “ tended to prevent the greatest drawbacks of distemper painting, viz.,  
 “ the liability of the vehicle or pigment to crack and scale off, and that  
 “ of the paper ground to lift or crackle?”—Yes; I think so. Resinous  
 varnish, or the substance of an oil painting in general is not much  
 affected by heat up to a certain amount. I apprehend it does not con-  
 tract or expand very much. On the other hand, the distemper vehicle  
 has an affinity with moisture, and I think it requires to retain a  
 certain degree of moisture to keep it in its normal state. If you were  
 to hold a piece of paper covered with distemper colour, mixed with size  
 or glue vehicle, before the fire, the chances are that the colour would  
 lift up from the paper, and fall off in scales, whereas oil paint would be  
 unaffected by the same degree of heat. Too great heat and dryness  
 may, however, injuriously affect oil pictures in other ways, especially  
 such as are painted on wooden panels. There is not that adherence  
 to the ground that there is in oil colours; distemper does not hold as  
 an oil vehicle does to the canvass on which it is placed.

29. Do you think a condition of uniform dryness would be inimical to the preservation of the pictures?—It would of course depend on the degree of dryness, too great dryness might be as bad in some cases as too great humidity; generally speaking uniformity of temperature, &c. is good. Abrupt alternations of dry and damp would certainly be prejudicial to both oil and tempora pictures. If tempora colours were kept too dry they might become brittle and friable, and be liable to be removed by the touch of the finger.

30. But this size would be of the nature of glue, would it not?—I suppose it would be so.

31. And when the glue is dried up to the condition of being hard, would exposure to the atmosphere be likely to affect it?—I apprehend most glutinous substances are liable to imbibe again moisture from the atmosphere. Paper will absorb a great deal of moisture, and the film of distemper colour itself is bibulous. I have no doubt these cartoons have from time to time absorbed a great deal of moisture, without, as I think, its having done them much damage, and it may have tended to keep the vehicle flexible. Of the two I certainly think a very dry and heated atmosphere would be more detrimental to the cartoons than the average temperature and atmosphere of Hampton Court.

32. Do you not think that size exposed to a moist atmosphere is liable to become decomposed, and to injure not only the pigments, but also the paper?—Doubtless if the moisture were excessive that might be the effect; but I am speaking of the ordinary atmosphere of our climate.

33. I suppose you are aware that the air of South Kensington contains a great deal of moisture at all times; that it is never a perfectly dry air?—I have sometimes thought the air in the galleries at South Kensington was much too dry.

34. From what do you judge that to be the case?—From my own sensations; feeling the heat and dryness.

35. Paper when moist would absorb sulphurous acid and other gases, would not that be deleterious to thin drawings?—No doubt; but I am not supposing that the paper of the cartoons has ever been actually “moist.”

36. Then as far as the atmosphere of London generally is concerned, that might be injurious?—Another set of evils would doubtless come

3 July 1865.

*J. C. Robinson*, into effect from excess of humidity. You might have decompositions  
*Esq.* and decay.

3 July 1865.

37. You assume all the intermittent states of the atmosphere ?—Yes.

38. On cold wet days on the banks of the Thames, the air must be saturated with moisture, and the cartoons would get moist, while in summer time they would be dry ?—I think the moist atmosphere of Hampton Court would, if anything, be more prejudicial to the oil pictures than to the distemper pictures.

39. But would not the moisture get into the substance of the paper ?—No doubt it would if greatly in excess ; but I think they have never become so damp by natural means as to exhibit any deterioration from that cause. On the other hand there is little or no cracking on the surface. The evidence of too great dryness being the tendency to scale off.

40. The scaling of the paper ?—The scaling of the pigments and the bulging, blistering, and lifting of the paper at the edges of the sheets, but I see very little change in the pigments, which would be the case if the damp had affected them. I have no doubt that moisture is the cause of the principal changes that take place in lead vehicles.

41. I suppose we may take it that a certain medium should be observed ?—Precisely so.

42. Then an atmosphere too damp would be injurious ?—No doubt of it.

43. And an atmosphere too dry would be injurious ?—Yes.

44. On what grounds do you arrive at the conclusion that the position of South Kensington is not within the medium limits which you consider best for this purpose ?—I consider the conditions are very variable. The conditions of one part of the building may be different from those of another part. I have at times observed in some of the rooms a stagnant heat, which I consider to be too great. I have been in some of the galleries when I consider they have been much too dry and hot.

45. Heat and air not in motion ?—There appeared to be little or no motion ; but in other parts of the building there is sometimes too much motion of the air, amounting almost to draught. You have, I think, a problem to solve of the most difficult kind. What might do for one part would not do for another. In the case of the picture galleries I am under the impression that the air there has occasionally been too stagnant, and the heat too great.

46. The cartoons are in a certain portion of the building ?—In a long gallery.

47. Do your remarks as to the dryness and heat and stagnation have reference to the cartoons ?—No ; the gallery was not re-adapted for them when I wrote my report.

48. Then you do not know what is the state of those rooms at the present time, whether the air is stagnant or in motion ?—I have no knowledge.

49. You draw a contrast between the present method of heating by hot water pipes and the method which you propose ?—I should wish to correct my remarks on that subject in some degree. It is that I have observed at Kensington, and also in some private houses where there are collections of pictures heated in the same way by hot water, that the condition of the air of the rooms has apparently been too stagnant ; there has not been motion enough in the air, not sufficient ventilation ; in fact, I think the heat from hot-water pipes is liable to get in excess. People who possess this means of heating often abuse it, and there seems to be no rapid method of diminishing or increasing the heat. In the sudden changes of temperature in this country it is

very important that a quick and ready method of regulating the heat should exist. The temperature at the early part of a day may be cold; a change of wind may suddenly take place, and great warmth may ensue, but the heat in your water pipes cannot, I apprehend, be so suddenly modified; this is, perhaps, nevertheless, a matter which can be got over. I have myself a leaning towards open fire-places.

*J. C. Robinson,  
Esq.*  
3 July 1865.

50. You do not say that bad ventilation is a necessary concomitant of heating by pipes?—No; but on the other hand I think good ventilation is promoted by open fires, which occasion a considerable movement of the air to take place. The cold air is brought in from the outside, and the impurities are carried away up the chimneys. This motion of the air I apprehend does not exist in the case of heating by water pipes.

51. What then is the condition of the air?—To my mind it often remains comparatively motionless.

52. Supposing this room were heated by water pipes?—The heat would rise, but there would not be so much motion of the air as is caused by the fire; the influx of cold air would not be so great as with an open fire.

53. Supposing there were a large number of people in a room, would not the products of respiration ascend to the upper part of the room?—This brings me to another point; the effluvia from visitors. That is a very important point in connexion with public galleries. Supposing it is a wet day, people come in with wet clothes; if the heat is beyond a certain point great evaporation takes place from the clothes, that is of water charged with noxious gases of different kinds. Then again there is the breath. I think you want active ventilation to carry the products of respiration and evaporation away.

54. The products of respiration would, on account of the higher temperature, go upwards?—But you have the carbonic acid gas which is heavier; would not that go downwards?

55. Would not the mixture act as a single gas?—Would it not be rather liable to hang about than to pass away upwards?

56. Admitting that, do you consider that ventilation which takes away the air from the lower portion of the room is more efficient than that which carries it away from the upper part of the room, the ceiling?—My belief is that the more rapidly the air is renewed in the room the better, so long as there is not a disagreeable draught.

57. Where would you bring in the fresh air?—That would depend upon the arrangements of the room. I speak only in general terms. I have not given especial consideration to the heating of the Museum. I have seen the effects of deleterious gases on pictures.

58. You say, in the 10th paragraph of your report, “The best method of heating galleries or apartments containing works of art is, I believe, by open fireplaces or stoves (as at the basement story of the British Museum), and that adequate ventilation and the maintenance of an equable temperature and proper atmospheric conditions can, I believe, be secured on no other system.”—I ought to modify that to some extent. I should rather have said, as far as my own experience goes, it is the best system.

59. You consider it the best system, chiefly, if not solely, on the ground of its moving the air more rapidly than the other system?—That is one reason. But with open stoves you have also a ready means of moderating the temperature. I apprehend you can put out the fire in a stove quicker than you can get the heat down from the water pipes.

60. You speak of “adequate ventilation,” and “equable temperature;” supposing you have an open fire-place in a picture gallery, will there not be a rush of air to the fire-place?—Yes.

*J. C. Robinson, Esq.* 61. Then the room cannot be heated by the heated air?—I do not think that is a disadvantage.

3 July 1865. 62. You have your fire-place burning open to your picture gallery. There is, you say, a motion of the air towards the fire, and a rush of air up the chimney, and consequently great heat; therefore the gallery, if warmed by that fire, cannot be warmed by the fire heating the air and distributing the heated air to the room, because the motion of the air is from the room to the fire, and not from the fire to the room?—By some means or other the air is warmed; at all events, the temperature is raised; how it is I do not say.

63. Then it must be by radiation?—I presume so.

64. But, supposing a gallery to be of a certain length, radiation will diminish with the distance from the fire. The air nearest the fire will be hotter than that at a distance from it, according to the laws of radiation?—I presume it will.

65. Considering these facts, you could not have an equable temperature in a room of that kind heated by an open fire-place?—I imagine you would have two or three fire-places in a long room, or you might have a stove in the centre.

66. Does not that bring you nearer to the hot-pipe system?—The stove would produce a movement of the air which the hot-water pipes would not.

67. As regards equability of temperature, would not the same objection hold good with a stove as with a fire-place, viz., a reduction of radiation at the parts furthest from the fire and greater heat near it?—I do not expect absolute equability; that may not be possible. One great point with works of art is to avoid abrupt and sudden changes of temperature. If a picture were hung near the fire there might be some difference, but not, perhaps, so much as to be of any moment.

68. The temperature of the hot-water pipes which heat the rooms here must certainly be below boiling point or  $212^{\circ}$ . The utmost therefore that you could do would be to raise the temperature of the pipes to  $212^{\circ}$ , whilst the power to make a coal fire in the same bounds might raise the temperature to  $2,000^{\circ}$  Faht. Do you not think there is greater power of producing abrupt changes of temperature, which you consider so prejudicial, in the hands of the man who has coal to deal with, than in the hands of the same man having only hot water to deal with?—I think there would be advantages in having open fire-places. I assume that the heating of the galleries would always be put into the hands of proper and careful persons who would see that violent extremes did not take place.

69. Where a number of persons have the means at command to vary the temperature from its ordinary state up to a very high state, have not those men more power to create abrupt changes than if they were restricted to a maximum of  $212^{\circ}$ , as is the case with hot-water pipes?—If water cannot be got beyond the heat of  $212^{\circ}$ , and a fire can give air or heat very much beyond that, the one seems doubtless liable to more abuse than the other, but in practice the persons employed to regulate the heating would know what to do. I almost doubt whether you could get the extreme radiation from an open fire that you speak of; you might get a fierce heat close to the fire, but at a few yards off practically it might not be too great. I would throw out as a suggestion that there should be a combination of the two systems; from the hot-water pipes you might get a certain amount of equable heat, and from the open fires you might obtain a greater circulation of air. I feel that ventilation in regard to works of art is almost as important as heating to a proper degree of temperature.

[The witness here mentioned the gallery of the Louvre, in Paris,

*J. C. Robinson,  
Esq.*

3 July 1865.

as an example of a badly ventilated gallery, and described certain evil consequences to the pictures from the condensation of moisture on the surface of the pictures from the vapour arising from great crowds of visitors, especially on wet Sundays, or fête days, when the Louvre is frequently greatly overcrowded. At the time the witness referred to there was no ceiling ventilation or artificial heating.]

70. You say there ought be no draught of air?—I think there should be as much movement of the air as is consistent with the avoidance of an unpleasant draught to the visitors.

71. Have you ever made any experiments as to the velocity or speed with which this air, warmed by hot water pipes, moved in the room?—No, I have not.

72. Have you ever thought of the possible inconvenience of these fire-places with regard to people congregating round them in cold weather; you know a pleasant fire always attracts people round it?—At Marlborough House there were open fire-places, and I do not think there was any undue crowding about them. The rooms were very often filled with visitors, and I never saw any crowding round the fire-places. In cold weather there was always a cheerful fire, and the appearance was agreeable, if the heat was not great.

73. You object to the present system of heating this building, because you think it is not sufficiently under control?—That is one reason.

74. If there were an excessive temperature would not one see it on the thermometer register?—I can only say some parts of the museum have appeared to me to be too hot, and others too cold, whilst in other parts I have experienced unpleasant draughts.

75. You have not looked at the thermometer register?—No.

76. Do you suppose that the surface of a picture in a room heated with hot water is colder than the other parts of the room?—Bright surfaces are, I think, usually colder than dull or absorbent ones. After very cold weather on a sudden change of temperature you very often find pictures covered with moisture condensed upon them.

77. Have you ever seen that to be the case in this building?—I have not especially remarked it here.

78. Why do you suppose it to have been the case in the Louvre?—Because on the occasions I have alluded to it was visible to the eye as a mist or dew on the surface of the pictures.

79. Do you imagine if the surfaces of the pictures had been warmer there would have been the same deposit upon them?—I think the vapour would not have condensed so readily upon warm surfaces.

80. Would you propose to keep the fires up all night?—To a certain extent. I would never have the rooms cold at night. I do not know whether the water in the pipes is kept hot at Kensington, if not, I think it ought to be.

81. You think there should be means to deal with the varying temperature of the day?—It seems to me desirable that there should be.

82. With regard to the atmospheric changes of temperature that occur during the day you can hardly call them of an abrupt character, nor so abrupt probably as would be occasioned by poking up a dark fire. Would not the poking up of a fire occasion a more abrupt change than the alternations of the external atmosphere?—I do not think so. The atmospheric change would be general, whereas the poking up of the fire would create only a partial and transient change. I think atmospheric change would be greater than any reasonable amount of change that would be accidentally effected by open fires.

83. That is your impression?—Yes.

84. In your opinion would the evils you attribute to the hot-water

*J. C. Robinson, Esq.*  
 pipe system be removed or mitigated by a different mode of placing the pipes?—There are bad methods in this respect and good ones. I think the plan of placing the pipes round the walls under the pictures, as here, is a bad one, and the pictures are thereby liable to be unequally heated.

3 July 1865.

85. You would prefer placing the pipes more in the centre of the room?—I think it would be better than round the walls.

86. You attribute the deposit of moisture on the pictures at the Louvre to the surface of the pictures being colder than the other parts of the room; if the pictures were over the hot-water pipes, and warmer than the rest of the room, would not that prevent the moisture getting on them?—I think with pictures with bright surfaces it is not easy to get them warmer than the material of the wall on which they hang.

87. On what do you found that opinion?—On a general observation of the matter.

88. In this room, for instance, most of the objects have been in it for a long time, and are all of the same temperature, if you placed your hand on a cartoon and then on the fender, you would experience different sensations; should you infer from that that the one object was colder than the other?—I should say apparently it was so. A concurrent indication in this matter is the deposition of moisture. After the last great frost I was in great perplexity about my own pictures. The change of temperature was very abrupt, the walls and pictures were cold, a volume of warm damp air came into the house, and the result was that every picture became covered with moisture as a kind of dew, condensed upon the cold surfaces. One occasion of that kind may do great mischief.

*here*  
 89. Is your own house warmed by open fire-places?—Yes. Perhaps if I had had hot-water pipes it would have been better in such a conjunction. I am not prepared to say that in all cases heating by hot-water pipes is a bad method, but the applications of it I have seen appear imperfect.

90. What should you say was the lowest temperature of the galleries here?—That is a question I cannot correctly answer.

91. Does the average temperature of the galleries here sink below 50°?—That I cannot say.

92. Supposing it does not, are you likely to have deposits of moisture on the pictures here?—I think a warm atmosphere outside would speedily augment the temperature inside.

93. Would you get a deposit of moisture under those circumstances?—Speaking without much thought, with a temperature below 50°, you might, I dare say, have a deposit on your pictures all the same.

94. When the temperature outside is 40°?—I do not know about the temperature outside; I am not prepared to speak with accuracy as to degrees of temperature, my observations having been of a general nature. It is always one of those things which should be taken into account in a picture gallery; I mean the sudden change of external temperature after long continued cold weather.

95. Might not the effect you speak of be produced from the low temperature of the room at night?—Possibly. A picture, moreover, hangs with its frame in contact with the wall, and the picture probably gets a certain coldness from the wall. Protecting pictures with glass is an excellent method of preventing the condensation of moisture on them. The moisture collects on the glass from its being colder than the surface of the picture.

96. Have you never observed condensation behind the glass?—Yes,

I have, and sometimes deposits of dirt as well. At the same time it *J. C. Robinson, Esq.* is astonishing how effectually glass protects pictures in London. You find the glass covered with smoke and dirt, while the pictures are intact, and would not sully a delicate handkerchief. That I think is mainly due to the colder surface of the glass.

97. Supposing a picture is placed against a cold wall, and there is a deposition of moisture on the inside of the glass ; then, if the temperature is elevated, will there not ensue a distillation of moisture from the glass on to the picture ?—Perhaps ; but I chiefly refer to smoke and dust—glass is a great protection. Pictures are seldom or never hung in actual contact with the wall, the frames intervene ; and although the surface of the picture may be colder than the wall, the glass on the other hand will be still colder than the picture. There is, however, a point which I cannot at present determine, namely, whether pictures should be entirely shut up in glazed cases, or not. I cannot at present determine in my own mind if it is desirable to entirely exclude the air from the cases ; but at all events if you lock up a picture in a mahogany glazed case air-tight, or nearly so, I have no doubt the picture will in the long run be much better protected than it would be if left unglazed. It is not pictures alone that suffer from abrupt changes of temperature ; such changes injuriously affect many other works of art such as this Museum contains. Many objects of antiquity, into the composition of which several different kinds of materials enter, may be very much affected from the different degrees of contraction and expansion of their component substances.

98. Do you think that takes place more with hot-water pipes than would be the case with open fire-places ?—That is a wide question. I can only say I incline more to open fire-places than to the other system of heating. There is one way in particular in which I think that a too dry stagnant air may be deleterious. In the case of furniture, wood carvings, &c. a gradual desiccation of the material is likely to take place ; particularly in the case of furniture ornamented with inlaid woods, or as in Boule work of wood or tortoise-shell inlaid with metals, the various kinds of wood and metals shrink in different ratios, and the inlays may become dislocated. I am inclined also to think that insects—one of our great pests—breed more rapidly in a too tranquil over-heated atmosphere than they would do in an atmosphere in greater motion. I think furniture on which beetles were at work would stand a greater chance of being eaten up if placed in a very dry quiet atmosphere than if exposed to proper ventilation from the change of air throughout the Museum at large.

99. The two great points to be considered are ventilating and heating. When you speak of a stagnant heated atmosphere you refer to your personal sensations rather than to any experiments you have made in the matter ?—I have never made any stated experiments upon it.

100. You have not recorded the amount of displacement of the air ?—No, I have not.

101. Then as to equability of temperature to be affected by open fire-places ; it is by direct radiation that a gallery must be warmed by such means, and it is possible to raise the temperature to 2,000° Faht. After a fire is lighted the heat is radiated, the rays striking the objects near and heating them more than those farther off. Under such circumstances would you not say that the objects are exposed to much greater variation of temperature than when the hot-pipe system is employed by means of tubes containing boiling water which cannot be heated beyond a certain point ?—I don't quite follow your argument. There may be modifying conditions with regard to open fire-places to neutralize evil

3 July 1865.

J. C. Robinson, effects. Take the case of a picture at one end of this room, and a strong fire at the other end. When the fire is first lighted the picture may be very cold, but when the fire has been burning some time according to your illustration I suppose the picture ought to get very much too hot, but practically I do not think it would.

3 July 1865.

102. It is to be assumed that the change in the temperature of the picture ought to correspond with the increased temperature which the room acquires as the rays of heat from the fire strike the objects in the room?—Practically it may be so.

103. Take the case of your own body standing near a bright fire: the nearer the fire the more intense the heat is?—Yes.

104. Then substitute pictures for your body?—Yes; but you would not put pictures close to the fire. At the further end of the room you would feel no direct influence of the fire.

105. With regard to the drawings at the Louvre, which are exhibited on Sundays, are they shut up on other days?—I believe so. I think they are covered with curtains when not exhibited. At Lille, in the Musée Wicar, where there is a very valuable collection of drawings by the ancient masters, the drawings are kept covered with curtains. They hang on stands across the room, and a green curtain goes quite across each stand or row, and it is withdrawn by the attendant who exhibits the pictures. Reverting to oil pictures, I may remark that pictures painted with much oil suffer more than those painted thinly. The resinous varnish does not change, but the oil does. The darkening of oil pictures is, I think, greatly to be attributed to the excessive quantity of oil. The pictures at Hampton Court, moreover, have been probably covered at different times with varnish having a certain amount of boiled oil in it. It is, I think, quite certain that oil darkens by deprivation of light. The old painters used to bleach their oils in the sun before using them, from Van Eyck downwards.

106. If air and light were admitted to the oil, what would be the state of the pigments?—The picture, on the whole, would gain no doubt.

107. The action would be upon the oil, not upon the pigments?—The pigments would retain their original brilliancy by being withdrawn from the light, while the oil would darken. In remedying one evil, you incur the danger of falling into another.

108. With reference to open fire-places, do you consider they are as safe in the handling against risk from fire as the hot-water pipe system?—I apprehend one system would be as safe as the other under proper regulation.

109. On the subject of exhibition by gaslight, you say in your report:—“Damage from exhibition by gaslight could occur only in ‘one or two ways, viz., by an escape and admixture of gas in the air ‘of the room, and the diffusion of the volatilized products of combustion therein; but I fear there is to a certain extent danger of this ‘at South Kensington’?”—What I meant to say was that I believe that unconsumed gas and the products of combustion are to a certain extent diffused in the air of the galleries at South Kensington. I have, however, no great fear of immediate damage, generally speaking, from the gas; in the case of the cartoons, they are, I apprehend, well protected by being glazed.

110. You think some damage might be occasioned by the products of gas and by the escape of unburnt gas?—Yes.

111. You say the pigments are affected by the gas?—I think gas would affect, to a certain extent, white lead and other sensitive pigments. White lead in a distemper vehicle put into a bath of gas would, I think, be liable to turn black immediately.

112. Is not your fear with regard to gas chiefly on account of the sulphuretted hydrogen?—Neither coal gas itself nor the impurities mixed with it would have any effect upon certain pigments, whilst others would, I think, suffer immediately.

*J. C. Robinson,  
Esq.*

3 July 1865.

113. You think those pigments containing white lead would be affected?—My present belief is they would. I have seen many instances of the blackening of white lead pigments in works of art, and I am convinced it was caused by bad atmospheric conditions. I think the mineral pigments would be most affected by gas, and some organic colours might also suffer.

114. You advocate "shutting off the gas from the containing spaces "beneath the level of the gas burners, and obviating all possibility "of escape of gas into the galleries by excluding the supply pipes "from the interior of the same"?—Yes; when the gas is lighted, though it is done as quickly as possible, there is always an escape of unburnt gas from the burners when they are turned on, and you may smell it. The ventilation when the gas is burning appears to be tolerably good; and I think if the gas were actually shut off as I have suggested, the works of art could not materially suffer from exhibition by gaslight.

115. Do you think the condition of the rooms produces undue desiccation?—I think at times this condition has ensued.

[The witness, in illustration of the liability to constant change from variation of temperature of pictures and other ancient works of art, described the mode adopted by picture restorers to secure the unrestricted contraction and expansion of panel pictures, and the Commission then adjourned.]

South Kensington Museum 10th March 1866.

PRESENT:

PROFESSOR TYNDALL, F.R.S., IN THE CHAIR.

DR. PERCY.

LIEUT.-COLONEL SCOTT, R.E.

CAPTAIN DONNELLY R.E., (Secretary).

MR. R. REDGRAVE, R.A., was requested to attend.

Sir MATTHEW WHITE RIDLEY, Bart., M.P., examined.

116. May I ask, Sir Matthew Ridley, what first drew your attention to this subject? You feel an interest in art, of course?—I have frequently visited the gallery, and here I would ask permission to observe that the remarks I made in the House of Commons in 1863 were not made in any captious spirit whatever. But I had been previously acquainted with the Vernon Collection, and I may say with the Sheepshanks Collection, too, during the time of their being exposed to view at Marlborough House. I lived near there, and was constantly in the habit of going in. Many of the pictures were familiar to me, partly from old acquaintance, and partly from having pictures by the same masters, more or less. After their removal to South Kensington my visits here were not infrequent; and it was about the year 1863, I think, more especially, that the impression made upon my mind at the first visit, namely, that the pictures were deteriorated in condition and

*Sir M. W.  
Ridley.*

10 March 1866.

Sir M. W.  
Ridley.

10 March 1866.

presented in their surfaces a very great difference from that which they presented at Marlborough House, was to a certain extent confirmed. And on the occasion of the vote coming on I did make some remarks upon the matter, and I beg to state that they were not made in any captious spirit, but with a view to the public advantage, and in no other sense. Perhaps you will put such questions to me as you please, for I may be perhaps a little more diffuse than is necessary.

117. Then the letter I have here (see App., p. 92) refers to the difference of impression that you obtained in Marlborough House as compared with the impression you experienced at South Kensington. That is to say, you went to Marlborough House, you inspected the pictures there, and when you came here and inspected them, you believe you found them more deteriorated or injured here than they were in Marlborough House? —That was so, in my opinion.

118. You trust your memory simply and your judgment, in a common-sense way? —I should say that before I made those observations I had looked at your pictures at South Kensington frequently. I made several visits, not with a view of finding fault, but of seeing whether the impression produced on me at the time of my first visit was correct or not, and therefore I did not make those observations other than upon the conviction and impression upon my mind at the time. I believe myself, I was right in making those observations.

119. Then when you first saw the pictures here you deemed them to be in a worse condition than at Marlborough House? —I did so.

120. On your subsequent visits to South Kensington, did you think that the pictures had suffered further deterioration? Comparing your first impression at South Kensington with that at Marlborough House, and then your subsequent impression at South Kensington with the first, I wish to ascertain whether, in your estimation, the deterioration was still going on? —Just so; that applies to the year 1863. I shall be quite prepared subsequently to tell you my impression at the present time. That letter was written in 1863, and my answers refer to 1863.

121. I thought that previous to 1863 you had visited the South Kensington Museum several times? —I visited South Kensington most frequently in 1863.

122. Then you could not state exactly whether during the exposure of the pictures here they were deteriorating. You simply noticed a difference between them at Marlborough House and South Kensington? —I noticed a difference had arisen between the time of their leaving Marlborough House and my first visit to South Kensington.

123. Will you kindly state your present opinion. Do you think they are still being deteriorated or has the deterioration been arrested? —In many of the pictures noted in my original catalogue a change has been more or less effected by the attention paid to them in one way or other. I observe that a good many are now under glass, which were not under glass in 1863. I am not prepared to state them all, but in going through the gallery I noticed certain pictures which are now under glass which were not then under glass. That I believe to be the case.

124. Then you consider that more care is taken now than when you first made your inspection of the pictures? —Well, it is not clear to me that covering the pictures with glass is an evidence of more care being taken. It is a question whether it be wise to cover pictures with glass or not. That certain pictures that I marked as being in an unsatisfactory condition have now been glazed is, of course, *prima facie* evidence that there is no neglect. But the charge of neglect I beg to state I never made.

*Sir M. W.  
Ridley.*

10 March 1866.

125. No. Our object, Sir Matthew, is to ascertain any defects which may exist at the present time, and to try and devise some remedy for them. What are your impressions with regard to the state of the gallery at present?—My impression from certain visits I have made lately—I have only been once or twice in the evenings, but several times since I came to London—is that your temperature is in the main too high—not universally so, but at most times. The thermometer is frequently up to 60° and 61°. The thermometers, so far as I have observed them in the National Gallery, are seldom allowed to stand higher than about 55°. And I find that the hot air which comes from the pipes immediately under the pictures here is very stifling indeed. I fancy, though my recollection may be incorrect, that in a portion of the gallery in 1863, there was what I believe I described to Mr. Lowe as a perforated grating immediately underneath. If that was so, I think a portion of this has since been covered by the boarding immediately below the pictures. That is my impression, but I am not quite clear about that. With respect to the condition of the pictures there, I think a good many of them are in a critical position, and one in which I should not like to see them if they were mine.

126. You speak of a temperature of 60° and 61° as something high—do you consider it too high?—I do in a general way; I think it is too high.

127. Do you know the average summer temperature of this country, say on an average summer day in a shady place?—Well, I should be puzzled to say in such a climate as ours. I do not know the temperature as many do; but I apply the question of heat and temperature to the belief I hold, that pictures subject to high temperature continuously will certainly be affected sooner or later. It desiccates the whole thing, and will act in shrinking the canvas; in the case of certain pictures painted in certain manners it will give them a greater disposition to "flux," to use a word that I apply to this subject; and it will give the outer varnish upon a picture greater reason to contract. Any sudden or violent alteration of temperature, especially if there were any damp, would relax and slacken the canvas; that would cause a subsidence of the surface of the canvas, or whatever it may be. Of course this will affect more or less the vehicle in which the picture is painted, according to the thickness of its texture and certain other circumstances.

128. Now, with a view of ascertaining whether this excessive temperature really exists in South Kensington, do you think the changes of temperature you spoke of in your last answer are prejudicial, and that the injury would be proportionate to the suddenness of the change?—I think certain changes of temperature would be prejudicial. In one of my catalogues I have marked that the thermometer in the Vernon Gallery was at 65° with the window open at north end.

129. What was the date?—It was in 1863, before I wrote to Mr. Lowe; probably June 1863.

130. You object to that temperature of 65°, you think it too high?—I do think it too high to have continually.

131. What are we to do? In the month of June 65° is a moderate temperature. We cannot get rid of the warmth of the general atmosphere?—I don't know whether you have here, they have blinds at the National Gallery, which draw across the top by means of pulleys at the side.

132. I was speaking of the temperature of the air in June in places where the sun is excluded, and I say the temperature of 65°, which you consider too high, is really a low temperature for a June day in the shade. How are we to meet a case which is so entirely dependent

Sir M. W.  
Ridley.

10 March 1866.

upon the temperature of the air outside?—I am not attending the Commission to lay down a system of ventilation. I attend here to say what I thought was and what I consider is the condition of the pictures. I have never set myself up as one really able to treat of the question of ventilation. You must take my evidence as that of one who has given some attention to art and pictures, and who is and always has been more or less a collector and owner of pictures, and I have obtained a personal familiarity with the subject in that way. I could, only I don't like to intrude more observations than are necessary, and I would prefer answering questions—I could instance galleries in which the employment of gas is certainly attended with most prejudicial effect. But I admit it is different here.

133. With regard to this temperature of 65° which you remember, do you think that this would be remedied by the transfer of the pictures at South Kensington to the very best site in this kingdom. Choose any other site in England, without going to the top of Snowdon or Skiddaw, and let it be on the same level above the sea as South Kensington, do you think you can get a lower temperature than you refer to?—I do not think it is necessary to consider the position of the building in which the pictures are exposed as regards temperature—not at all.

134. To make my meaning quite clear, let me ask whether you object to the temperature of 65° as being too high for the pictures for any length of time. Our vocation has led us to inquire into what an ordinary summer temperature is, and I assure you that throughout England it is on an average much more than 65°; so that this temperature of 65° is not a condition peculiar to South Kensington. But wherever you place these pictures, you would have in the summer a higher temperature than 65°. We cannot escape from it?—It might be so. It is a higher temperature than that in which my pictures have lived either in London or the country.

135. What is the temperature in Italy, for example, where there are a great many pictures?—The atmosphere in Italy is much drier than the atmosphere of this country.

136. Then you think drying, desiccation, good, Sir Matthew?—No, that does not follow. I think it better for pictures to be in a dry atmosphere, such as that of Italy, than in an atmosphere like that in this country, especially in London, where it is charged with many impurities, of gases and acids, which the atmosphere in Italy is quite free from. And therefore two pictures, painted relatively in the same vehicle, and to which the same chances are given, the one being placed in England and the other in Italy, that placed in Italy would in all probability enjoy under ordinary circumstances a much longer life than the one placed in London.

137. Although it might be exposed to a considerably higher temperature?—Even though it might be in something of a higher temperature. As far as my experience goes, I should say that might be the case.

138. You say you have been here at night; do you think there are any pictures here which would not bear the heat of the gas?—I have a strong impression that there is not only the additional heat created by the great number of persons congregated, but there must be a certain quantity of dust, a certain quantity of smudge, arise and float about and settle on the surface of the pictures.

139. That is common to day and night; we are now speaking of the night?—There is an aggravation of the evil attendant upon the passage of a great many persons where a large number of pictures are collected.

140. That would be an evil which glazing would tend to counteract in

a great measure,?—Unquestionably glass in front of a picture would tend to obviate that, but there are objections to that unquestionably.

*Sir M. W.  
Ridley.*

141. Some of the pictures remain in a good condition?—Yes.

142. That would indicate that those which are affected are so through some peculiarity, either of the vehicle or pigment with which they are painted?—I think that has a great deal to do with many of them. I could off-hand quote pictures in which I am satisfied that the vehicle or pigment has had to do with it.

143. Then there is a third condition, the varnish?—As to the varnish, I have no difficulty in answering that question if put to me.

144. Now, with regard to this admission of air, you refer here to the picture of William IV. at Oxford, and to the remark of the keeper, and the admission of air under the picture through an open trellis work? (*See Appendix*, p. 93.)—I did, but I would like to be clearly understood about that. I say there is a trellis at the back, but this remark applies to Kensington Museum, and *not* to the Bodleian at Oxford, and those trellises are, I now conceive, trellises for the admission of cooler outer air. When I wrote that—and I have the impression upon my mind still—I thought I saw a perforated grating at the bottom, immediately under these pictures, through which this hot air came, passing directly at the back of the pictures. I think that is likely to be in some cases very prejudicial. It would depend partly on what the nature of the canvas was on which the picture was painted; it might depend likewise upon whether it was a lined picture or not. That would affect the point as to how much or how little a picture might be injured by the heat going on behind it. And if I might be allowed in a certain way to make a remark which I think corroborates that impression, it is this, that I have observed in my own case of pictures, not of modern pictures properly speaking, but pictures painted a certain time ago, such as about the date of Hoppner and Wilkie, and as late down as Lawrence, though kept in a judicious temperature, certainly not below 65°—that if these pictures be hung continuously over a fire from which a considerable amount of warmth is imparted to the wall at the back of the pictures—a larger degree of heat than is perceptible on any other part of the wall within the room—they are more apt to change in their texture, to get dry, to contract, and to show fissures, than any other pictures in that same apartment under the same temperature, but not above the fire. That is one of those circumstances which have led me always to attach a great deal of importance to the access of so much heated air, either to the surface or to the back of a picture.

145. Are you acquainted with the temperature of that air, Sir Matthew, as it reaches the pictures?—I am not aware what this temperature may be; but this I am aware of, that I cannot hold my head over the pipes. No person can lean on the rails in the ordinary condition of the South Kensington Museum and examine a picture for any length of time. I have been there on several occasions, and on each occasion, especially when I have turned my attention to look at the condition of the pictures, I have never been able to remain above an hour, or an hour and a half at the outside, giving attention to the matter which engrossed me, without suffering from it individually. I do not say that the damage is effected at that time, but my notion of the treatment of a picture is, that it should be allowed to breathe, if I may so express myself. Its pores should not be closed, any more than the pores of the skin of the human body.

146. Then, Sir Matthew, your remarks on the temperature of the picture gallery are based upon your impressions, your sense of impression, the impression the warmth has made upon your skin, and not upon any thermometrical register or observation?—I am bound to say that as

10 March 1866.

Sir M. W.  
Ridley.

10 March 1866.

frequently as I could I have referred to the thermometers in the rooms. They do not vary very much. I ought perhaps to be more particular in doing so. I have looked at them on various occasions lately. I have found them more regular in the National Gallery than I have found them here. The temperature there, so far as I have noticed it this season, is about  $55^{\circ}$ , and I consider  $55^{\circ}$  quite warm enough. It has ranged from  $55^{\circ}$  to  $60^{\circ}$ , at the very outside. If the atmosphere be dry I consider that as high a temperature as pictures should live in, especially if it be a picture painted with doubtful material.

147. As a practical man, do you know of any means whereby we could keep the temperature of these rooms at  $55^{\circ}$  when the general temperature of the air outside is  $70^{\circ}$ ?—You must apply to those who have studied this subject of ventilation more deeply than I have. I came here to give you my own opinion, which I believe is shared by a good many other practical persons; and I certainly have the impression that a great deal of what I believe to be the changing condition of these pictures has been superinduced by the changes of temperature in which they have lived. Their constitutions have not been able to bear it in some way or other, and we see them not in as good a condition as we should like to see them in consequence. I am not aware whether your present system of having the gas up as high as you now have it has always been the system at South Kensington; my impression is that the gas was not so near the glass roof originally as it is now. I may be wrong. I speak under correction.

148. The Sheepshanks Gallery was the first made, and it has never been altered. There has absolutely been no change in the mode of admitting the hot air you speak of since 1863?—I speak under correction and am quite ready to take your testimony.

149. You are a picture collector and fond of pictures yourself?—I am.

150. Can you state what the temperature of your picture gallery is on a summer day?—Well, I have pictures all over the rooms in my house and I cannot tell you.

151. You have no idea of the temperature your own pictures are exposed to on a summer day?—Well, I certainly should not be able to answer that question. I do not attempt to fence with it. I cannot tell you.

152. You have no artificial means of cooling your rooms?—None but the opening of windows and doors.

153. So that if the air outside be  $70^{\circ}$  the air within will be  $70^{\circ}$ ?—Yes it must be so.

154. If the temperature to which your pictures in summer were exposed be over  $65^{\circ}$  would you consider it bad for the pictures?—I should have no hesitation in saying so; that is my impression. It would affect some pictures more than others, according to the mode or material in which they were painted.

155. You have noticed various causes of deterioration, and our object is to enable ourselves to meet defects, if such exist. You say the quantity of heat is too great. Does any means of meeting this cause of deterioration occur to you? Would you always insist upon the admission of hot air, if I may put that question first?—I should not insist on the introduction of hot air in the summer.

156. To-day, for instance?—I should think there ought to be warm air. But you see it was in May or June 1863, before I made those observations, when I found that certainly there was an admission of hot air, and that of course could not be said to be winter. If you asked me whether I could suggest any remedy, or anything to assist the protection of pictures exposed to the entrance of hot air at their backs in that particular manner—though it is a suggestion I should make with

submission, and likewise with reference to those who have really had the manipulation of pictures before them—I should, I think, myself, if it were cautiously done and in a proper manner, have preferred protecting the back of the picture, that is, the canvas by paper, provided it were tightly put on and attached to the canvas by some unobjectionable material as a strengthener to the canvas and as likely to prevent it from contraction. I throw this out as a suggestion, it requires a more advanced practical opinion than mine. But I do object to the shrinking of the canvas, which I think ensues as I have already illustrated.

157. You did observe the thermometers, I think, to some extent, and you found them pretty constant, did you not?—Yes, pretty regular.

158. Then, as regards the thermometers, the pictures would not seem to have undergone any of those great changes of temperature that you would consider prejudicial?—No, they have not, in a general way. But as I noted in 1863, there was this sudden violent blast from the north came in, and in a moment it was I don't know what.

159. Do you mean cold?—Yes, cold. It came in with a roar from the north end. The thermometer stood at 65°, and then this door was opened at the time I was there and in came the rush.

160. On a day in June—what was the date?—We can easily get the outer temperature on that particular day. [It transpired afterwards that the register of temperature outside the building was not taken at this period.]

161. You made an observation just now—a very just and important one, I think, and we have noticed the fact ourselves—that two pictures may be exposed to the same circumstances and conditions, and one remain in a good condition and the other become deteriorated. This depends upon the vehicle or pigments with which the pictures are painted. Do you know the vehicles or mediums used by Sir Joshua Reynolds, Wilkie, and Hilton, and the effect of them?—Sir Joshua, I believe, did not know himself, for his palette was generally set for him by a man who knew what his master's cue was and his fancy at the moment, and according to the humour in which his master was so he prepared his palette, and therefore he suited his master's palette in more senses than one. We know that certain painters have painted with certain vehicles at one time and with other vehicles at another time. Wilkie painted some of his earlier pictures in purer and better material than some of those of a later date, when he went into Spain and then took up more of the bituminous colours, which certainly have not answered a good purpose and which are dangerous. It is instanced in that very picture that I quoted of William IV. in the Bodleian Gallery at Oxford, where the sun coming in and pouring upon the material, which is in itself under such a form more liable to give way with heat, has destroyed it; it is gone, as the man said. There are two other pictures in the room, farther removed from the one the sun has acted so powerfully upon, which are not so much injured. I am sure the sun acts very powerfully indeed upon pictures painted in that sort of material. I am very clear upon the subject of the vehicle of the other picture of the Highland Drovers, which I remarked upon in 1863, and I looked at it very carefully. I may remark that that picture within that period, as I have shown, and given evidence of some portions of it not being painted in a pure vehicle—because I observe that to the right of this picture especially there is that fissure, that opening, that gaping in the surface more than there was in 1863. In 1863 the portion of that picture that was in the most uncomfortable state to me, was the body of the centre figure—namely, that of the Highland Drover. Since that period that picture has been glazed. I looked for that picture last year, but think it was out of

*Sir M. W.  
Ridley.*

10 March 1866.

*Sir M. W.  
Ridley.*

10 March 1866.

the gallery at the moment, and this was at the period when the cartoons were being placed here ; and on asking for the picture, not finding it, the keeper said, " Why, sir, there are several pictures not exactly in their usual place at this moment, in consequence of the placing of the car- " toons." Though I did not see the Highland Drover last year I have seen it this, and it has been glazed, through the glass I can see that the darker portions give the same indications as were given by the figure in the centre, according to my note in 1863 ; and I equally see that the left of the picture, which in my catalogue is marked perfectly pure, is perfectly pure now. But so far as my recollection serves me there is a larger portion of that picture affected than there was in 1863. When it was glazed I do not know, but the alteration might have taken place before the glass was put on. I do not advance the proposition that the glass has accelerated deterioration of those portions of the surface which are in dark colour on the right hand of the picture.

162. Sir Matthew, do you know the nature of the vehicle called meglyp ?—I am no great chemist, and I do not think I can go into this question. It is one of the pigments which sometimes when combined with others is very objectionable.

163. Have you paid any attention to asphaltum ?—I have paid no more attention to asphaltum than this, I know it is a bituminous preparation, and I have observed in pictures which are my own which are painted in asphalte that they require greater watching and more careful treatment, both as regards heat and chill, than any other pictures I have.

164. They do not bear changes of temperature so well, then ?—No, and you will find, for you have a picture now by the late Thompson of Duddingstone—I forget the title of it—that picture is one which if it were mine I should be rather jealous of. If that picture has not a very favourable chance I do not think it will have a very long life. But I have seen other pictures of Thompson's that I think rather more critical still ; and I possess one myself painted in asphalte, and I have paid great observance to it ; it is a very large picture.

165. Have you any knowledge of the behaviour of this asphalte under varnish ? When a picture painted in asphalte has to be re-varnished have you any knowledge of the effect of the varnish upon the picture ?—I have only this experience, I have seen it tried upon pictures painted in that vehicle, and I do not think they do stand eventually, as a rule. I think not. I know pictures now, painted by Francis Danby, that are liable to that suspicion. I may observe, whilst upon this subject, that there is a picture by him now, a fine work, and one upon which I should set great value if it were mine, and that is a Norwegian scene, which I think has been here since 1863. I have no note, I believe, in my original catalogue upon that picture, but I notice that a change has come over it. You will find, on looking at the left-hand side of it, a streak like a lightning streak as it were falling on the rocks. On looking at it the other day I thought it seemed like a desiccation of the paint. I think it is painted on panel. I have a large picture by Danby myself, in the country. It is in a tolerable condition, still I do not think it is to be trusted. I do not think any picture painted in asphalte is to be trusted in alterations of temperature, or where a powerful light breaks upon it.

166. I find appended to your remarks, which are stated here in italics, the remarks of Sir Charles Eastlake?—I think he examined them previous to their coming here—those in the Sheepshanks collection prior to their coming here.

167. (*Mr. Redgrave.*) Allow me to set you right ; when the Vernon pictures were brought here, there were many of them in an injured state,

and as it might have been said afterwards that they were injured by our temperature, and that any change which might take place was consequent on bringing them here, they were examined very carefully immediately on their arrival by Sir Charles Eastlake, Mr. Robinson, and myself. We went over them picture by picture, registered the faults, and although many of them now are cracked, still I think it will be found that these cracks were there when they came.

168. (*Mr. Redgrave.*) You recollect the Drovers at Marlborough House?—I do.

169. I think I must ask you to reconsider that?—I think it was there.

170. Do you recollect the other pictures as being at Marlborough House?—Off-hand I thought it had been at Marlborough House. I may be mistaken. I am open to be corrected.

171. I think you said, Sir Matthew, the pictures belonging to Mr. Vernon and Mr. Sheepshanks were in a different condition from what they are now; did I understand you so?—Certainly; those I recollect as being at Marlborough House were in my estimation in a better condition than when I saw them here; but which really are the Vernon and which the Sheepshanks, as distinguishing between the two, I do not pretend to say. I do not know that I ever knew which were Mr. Vernon's and which were Mr. Sheepshanks' at Marlborough House, any more than I do here. If I looked at them here and went home I should forget who the picture belonged to originally, but not the picture itself.

172. But generally you think the pictures in the Sheepshanks Collection were there as well as the others. Of course our only object is to ascertain the best way in which the pictures may be preserved, and we shall be indebted to you and to anyone else who will enable us by their information to ensure this desirable result. But the Sheepshanks were never at Marlborough House; they came direct from Mr. Sheepshanks' house here; and those pictures were photographed; the photographs were submitted to him as showing the state of the pictures when they came here. He was aware of that paragraph which you have marked about the landscape before you, as regards the condition of the picture when it came here, and sanctioned its being published. It never was at Marlborough House.

173. (*The Chairman.*) Sir Matthew saw these pictures before they came here; and his remarks chiefly refer to the changes in the Highland Drover which have occurred here. Had you, Sir Matthew, seen the Sheepshanks Collection previous to its coming here?—Oh yes, sir, I must have seen the pictures. None of them were new to me—not one, or very few at least—yes, there were some.

174. This photograph of a painting is very much injured, is it not? [*The same handed to witness.*]—According to this photograph there is a good deal that is unhealthy, that is clearly unhealthy. It is “The Refusal.”

175. If it were in a private house, say, in your own gallery, do you think you would feel that was in an unsound state, that it was dangerous for a picture to be in that state?—I should say it would be a dangerous state for a picture to be in anywhere.

176. Whence is that picture derived, Mr. Redgrave?—

(*Mr. Redgrave.*) That is a picture by Wilkie, from the Sheepshanks' Collection. That is the state in which it came from Mr. Sheepshanks' gallery. It was originally painted in the same way as the “Letter of Introduction,” a gray picture. It was sold by Wilkie, and afterwards repurchased. As he was dissatisfied with it, he went over it again, with asphaltum “painting into it,” and that is the cause of the disruption

*Sir M. W.  
Ridley.*

10 March 1866.

*Sir M. W.  
Ridley.*

10 March 1866.

Mr. Mulready was appointed to give advice as to the pictures of Mr. Sheepshanks, and knew the whole process, as he has told me repeatedly. He sat for the figure of Duncan Gray. [Another photograph was here handed to Sir Matthew Ridley, who said:—

“That picture was in a bad condition when the photograph was taken, there is no doubt of it.”]

(*Mr. Redgrave.*) That shows the state in which it was when it came here.

177. (*The Chairman.*) If these represent the state of the pictures when they came to this place it is a proof that this particular class of pictures, even in private collections, is liable to these injuries?—Pictures painted in asphalte are subject to damage of this sort. I have said that all pictures painted in these vehicles are to be suspected. You have one or two others here likewise. In answer to your question as to whether a picture painted in asphalte and varnished afterwards would stand, I think I may say this, I think it would not stand. I have seen instances myself in which it has failed, and Mr. Redgrave has corroborated this. There is a picture, No. 366, I think by Etty, which I noted as bad and in course of destruction. I see attention has been paid to it, I daresay judiciously, to improve it. There are several others that I have marked here that were not marked in my catalogue of 1863. Here is “The Dangerous Playmate,” a female figure sitting in the open air, by Etty, that was not marked by me in 1863, but I marked it the other day, in 1866, as in a curious state.

178. Then you think it is in a worse state now than it was in 1863?—Well, I made no mark in 1863, therefore I cannot draw any comparative conclusion, you see. But here is one, 361, “Study for a Head of Christ,” by Etty, and my remark in 1863 was simply “very evident.” I observe now that the head, for the time being, at all events, is clearly to be seen, but the whole of the rest of the margin of the picture appears to me to be galloping away, like many others. I daresay the head has been attended to, and rightly attended to.

179. (*Mr. Redgrave.*) I may say I have nothing to do with the Vernon pictures.

(*Sir M. W. Ridley.*) It is not for me to know that.

180. (*The Chairman.*) We are not referring to persons at all. Mr. Redgrave, have you given your attention to the remarks of Sir Matthew Ridley, that there are certain pictures here he has marked as very bad? Are those pictures one and all such as have been worked with asphalte or megylp?

(*Mr. Redgrave.*) I think the two great failures are from megylp and asphaltum. I know of no process by which you can stop asphaltum from giving way. The National Gallery had one of Hilton's pictures hung twice on its walls, and twice it had to be taken down. If you put a picture painted with asphaltum in the most favourable position you can, whether here or anywhere else, it will always “give way.” If you will allow me to say it, I have the same difficulty with the pictures in Her Majesty's palace—go they will. In the pictures I have charge of in the Sheepshanks Collection the megylp cracks are not so bad. I think the picture Sir Matthew Ridley speaks of, the Danby, is neither painted with asphaltum nor megylp, but with gold size, and that is another dangerous vehicle. What I wish to impress upon you is, that there are no known methods by which we can prevent asphaltum pictures going. It is not our temperature or any temperature. I am sure, if Sir Matthew has pictures in his own gallery painted in asphaltum, he will find them going.

(*Sir M. W. Ridley.*) They do not necessarily go, but they do necessarily

*Sir M. W.  
Ridley.*

go if they are exposed to heat and sudden chills. If the sun is allowed to get at them they will go.

181. (*Mr. Redgrave.*) Do you think, Sir Matthew—

(*Sir M. W. Ridley.*) I do not wish to enter upon a discussion with Mr. Redgrave, and I do not want to fence with the question; I quite admit your opinion as a professional man on these subjects must be better than my own.

182. (*Mr. Redgrave.*) I was going to ask a question, with the permission of the Chairman. Do you think, in the rooms of your house in Carlton Gardens, that the temperature is not sometimes down as low as freezing point when you are not there?—No, nothing like it, not so low.

183. But nearly?—Nothing like it. My rooms are regularly fired.

184. Have you any asphaltum painted pictures which have been preserved entirely without injury?—I have two.

185. Without any indication of injury whatever?—No indication of injury in either.

186. Will you give me the names of the artists?—One is by Francis Danby, the old man. It is in the country, I am sorry to say. I have had it long in London, but a year or two years since I removed it into the country, where it originally was. The other picture I have painted in asphalte, which is decidedly painted in asphalte, is a very large landscape painted by the late Dr. Thompson of Duddingstone. It is a magnificent picture, and though showing to a certain extent slight fissures, I have no hesitation in thinking that where it hangs it will last. It seems to have a tolerably retentive surface upon it now. It is favourably situated; it is not hung above the fire, but at the end of a dining-room. It is in very fine keeping, and I firmly believe it will so remain.

187. Have you had it varnished of late?—I do not think varnish has touched it for at least eight or ten years.

188. (*The Charman.*) You refer here to the report of the Commission on the lighting of picture galleries by gas, and you say it is not conclusive to your mind?—It was not, but I have not looked at it since.

189. Could you now sum up in a general way the recommendations you would give to us for our guidance, with regard to a better state of things here. First of all would you lower the heat?—I should lower the continuous heat, and I would not admit it as it is admitted. I have never professed—excuse me for saying—to be a picture doctor, but I have bought a good many pictures, and I have a good many of both the old and modern schools, and frequently add to them, and I know how I have treated them both in London and the country. I should like to make an extension of a remark I made at the early part of this sitting that with a view to protecting the pictures in the event of severe weather in winter, I was in the habit, a certain number of years ago, in the autumn of the year, of covering the whole of my pictures—unless there chanced to be one quite fresh from the easel—with a sort of semi-transparent lino which admitted the atmosphere, and I thought would arrest any chill and prevent it from lodging upon them. I did this for some years, and on the whole I found it rather objectionable. It was done partly to protect the pictures and partly the frames, the latter of course being of the least value. But I found that the rawness of the atmosphere of any London fog and nastiness, if they were not very attentive to the firing, adhered to this, and obstructed the passage of air and the breathing of the pictures. And I discovered this likewise, and here perhaps, I might be allowed to say a word upon the matter of varnish. I discovered that under these circumstances no old master's pictures

10 March 1866.

Sir M. W.  
Ridley.

10 March 1866.

and no picture that I had in my possession that had come originally from Italy in a good state, stood. I investigated the circumstances, and I found that the covering in front of the pictures, covering them as I had done, acted prejudicially upon the varnish if it contained within it anything whatever of an animal character, such as isinglass, or any of those things that are used. In coming back to London I had every picture that came to me with Roman varnish upon it put into a person's hands to remove it altogether, and since they have not stirred. The varnishing of pictures is a nice and fine point. I need not say that in the main it is very difficult to get the real mastic at this moment, and it has been more difficult to get within the last few years. From information I have received from people engaged in a large way of trade as decorators and painters, not in London, and people who have been artists, I have reason to believe that since about the period of the æcedion coming on to the vine something of an unfavourable nature affected the trees, and the island of Cyprus, from which I believe the best mastic is brought into this country, is unable to send the same quantity as formerly. I was told six weeks or two months ago that so much is this so, that a firm of large owners of pure mastic had been invited to sell their stock at a profit which I am told would have paid them 100 per cent. upon the old price, but they declined to do so.

190. With regard to the warming of the galleries, would you have them warmed in the middle of the floor?—Yes, certainly.

191. Have you paid attention to the comparative merits of warming with open fireplaces and with hot-water pipes?—I have been in houses where they have hot-water pipes and where they have open fireplaces. In a house that is well constructed I should always prefer the warmth from the fireplace for pictures. I think, sir, you put a question to me just now which was not altogether answered, as to anything I might recommend. I may observe that I am informed, and I am glad to hear it, for my impression was otherwise, that your gas has never been at a lower height within the building than it now is. I am glad of it, because it is unquestionably within my knowledge and under my observation, that in a gallery in which pictures are hung, where gas is frequently used, and that at no great height, the sulphur and impure particles from the gas deposit themselves on the face of the pictures, and it is marked by a nasty ugly blue line, and is as clearly indicated by a line right across the body of the picture as is the line of the malaria indicated in countries where it prevails, in South Italy especially, where you know the limit of its extent and range destroying vegetation and being prejudicial to health. Above that line you will find it more healthy, and certain plants will grow and flourish. I only mention that to show how the sulphur will attach itself to pictures in galleries frequently lit with gas.

192. When the gas is low?—Yes; that which is given off settles on the pictures, and that I am positive is destruction.

193. You are aware, Sir Matthew, of the commission of 1859, composed of Professor Faraday and others; they reported unanimously at that time that according to the system of lighting here pursued no such sulphur escaped in the gallery?—I read that evidence. (See Appendix E., p. 88.)

194. Then may I ask you whether, as regards this particular point, the diffusion of sulphur in the gallery, you have any reason to suppose that the gentlemen were wrong who made that report?—Well, let me understand your question. They did not report I think upon the condition and state of things at South Kensington. I think they reported upon the condition and state of the pictures in the National Gallery.

Sir M. W.  
Ridley.

[Report handed to witness.] Yes, I see they did refer here to the Sheepshanks Gallery.

195. I think, Sir Matthew, if I understood you right, your present impressions are that the lights are not injuriously low?—I think they are not injuriously low. There are not many of the pictures hung very high, they are rather low. What there is bad that makes its way off of the gas is, I think, to a great extent and in all probability carried off at the top. But there are comparatively few pictures, if I recollect right, hung at that height at which the gas deposit would reach them. I looked to that when I was in there.

10 March 1866.

196. You referred to that as a point on which you would like to make some remarks; is there anything else you would like to say, Sir Matthew?—There is nothing here that I particularly desire to observe. I may remark that I am aware that the use of asphaltum is not so common, at least I have reason to think not, amongst our artists as it was some years ago. I do not think it is necessary for me to touch upon the admixture of colours, and that sort of thing. But I think that the use of the blinds which are attended to in the National Gallery is a very great advantage. The glass at the top I observe is rendered to a certain extent opaque, and that is absolutely essential where pictures are hung.

197. Are you not aware that there are blinds here, Sir Matthew?

198. (Mr. Redgrave.) In the Sheepshanks Gallery, to which reference has been made, there is an outer glass and an inner ground-glass, and between the two there is a blind which draws across to prevent the sun's rays coming in. In the other gallery we generally cover the whole surface with canvas immediately the light weather comes in.

(Sir Matthew Ridley.) I was asked if there was anything I could recommend. Now I do not consider myself in a position to recommend anything in the face of professional men. I came here simply as an amateur, I would not even call myself a connoisseur; but I did suggest to Mr. Lowe in 1863, with great respect, I having in a certain limited sense joined issue with him upon the condition of works of art here, that I should have an opinion, out of courtesy as it were, apart altogether from the institution, and that of course I have, as everybody else has, every possible respect for the opinions of men of science or chemists—Dr. Percy, Dr. Playfair, and others—I share that fully with everybody; but I say in a matter of this sort reference is to be had to your practical men, through whose hands have passed, and through whose hands constantly are passing, pictures of all schools and all dates, ancient and modern. And I think it would be highly desirable—I make it only as a suggestion—that some person of much greater knowledge, experience, and practical acquaintance with canvas and paint than I am should be invited to give to this Commission information upon the subject. My own remarks, be it observed, that I have made now, or any remark that has been made in either of these catalogues, either in 1863 or this year, are entirely my own. No professional man has ever come here with me, or looked at the pictures with me; and I alone am answerable for what I have advanced. I have an impression upon my mind that if the opinion of a practical man was had it would be given not in an invidious way, but would be gladly given, because such men have the greatest possible interest in the well-being of these pictures as a national matter; and those men who constantly have modern artists' pictures through their hands are those who would give much more information than I could pretend to.

199. Do you think we should get an unanimous opinion from these men?—I would not have many of them. There are as many picture doctors as there are doctors for the human body.

Sir M. W.  
Ridley.

10 March 1866.

200. (*Mr. Redgrave.*) Is it not desirable to ask whom Sir Matthew would recommend, because I should be glad of his opinion in that respect?—I could recommend you a man that I think is thoroughly competent, and who I believe would conscientiously give you an opinion, but he has never been with me to the gallery.

201. (*Mr. Redgrave.*) I think we should be very happy to hear that man's views; I do not know whether the Commission would like to call him before them. Allow me to say that I shall be happy to learn from any persons whom the Commission think it desirable to call before them how I am to take more care of the pictures. I am speaking apart from the Commission.

(*Sir Matthew Ridley.*) It is not for any person to put himself forward in that way. It is usual to apply to the Chairman to be called, but these men do not like to obtrude themselves.

(*Dr. Percy.*) I think, if Sir Matthew would mention one or two names, the Commission would receive their evidence with great pleasure.

[*After some conversation Sir Matthew recommended Mr. William Cox, British Gallery of Art, 57, Pall Mall, as properly qualified to give evidence.*]

202. (*Dr. Percy.*) I should like to ask one or two questions in order to ascertain the effect of deterioration from cracking or otherwise. Do you think, Sir Matthew, any evidence more satisfactory could be obtained than that derived from photographs taken at distant intervals?—I admit that there must be great force in the evidence of photographs; but I would like to observe that with respect to that one particular picture of the drover, that that picture has certainly since 1863, though now attended to and glazed, deteriorated in parts which did not show deterioration before, and I think the same thing has been going on with some other pictures in this gallery. I think it commenced when they came here. It has gone on in the case of one or two of Sir Augustus Callcott's landscapes. In one there is a grey horse crossing the water, and the tree to the left of the picture is wider in its gapes than it was. The same applies to Jones's pictures, the gapes in which have been going on and going worse, in my opinion.

203. I think you said there was some reason to believe, or that some persons asserted, that it was not wise to place oil pictures under glass?—There are two opinions about it, but upon that I would like to observe, to show how great is the difference of opinion, I know an instance of a picture that was painted last year, a portrait by an eminent man, and it was ably painted, and to my astonishment just upon the completion of the picture I found it covered with glass, and I said, "This is against all my received notions, for I have always learnt from those of whom I have previously bought modern pictures never to varnish them when they were fresh and green from the easel," and I quite understand that that is right, because if you coat a picture with varnish before it has given off its oily particles, it will struggle and become flat. But the artist who painted this portrait was decided in the opinion that it should be immediately glazed, and it was glazed accordingly. He therefore considered it was well to glaze a picture, though it was perfectly fresh, but dry of course. This shows there is great difference of opinion about it. I am not in favour of it myself if it can possibly be avoided.

204. I was going to ask you whether from your own experience, you have found any injury to result to pictures under glass, in consequence of their being under glass?—I do not know that I could say I have, though I object to it if it can possibly be avoided.

Sir M. W.  
Ridley.

10 March 1866.

205. The next question is whether you have observed specially any damage done to any picture in this collection in consequence, as you believe, of its immediate proximity to the water pipes; any particular pictures or parts of pictures?—I think that several pictures here, according to my impression, have suffered from it.

206. And more in one part of the picture than the other, say more in the lower part than in the upper?—I think some have suffered in one portion and others in another portion.

207. Will you mention any pictures, that we might examine them?—There is a picture at this moment by Sir Augustus Callcott, which I alluded to just now, in which the trees on the left of the picture, as it now hangs, are a great deal more affected; in fact a certain portion of that picture is not affected at all, but the left hand of it is affected a great deal, and that hangs immediately above the pipes.

208. You were suggesting, sir, some time ago, that it might be desirable to apply some substance to the back of a painting, to the canvas, say; I think you suggested paper, or some material of that kind; have you ever made any experiments of that nature?—I have never papered a picture myself in that way with that view, but I have seen such good effects arise from the lining of pictures with a second canvas, whether painted by ancient or modern masters, that I should be disposed to think (with all submission to such practical people as you might call) that it might be done and defend the picture from the possibility of the shrinking and contracting of the canvas. If firmly placed on I should think it might possibly answer, but I only give a qualified expression of opinion on the point.

209. Which do you think most injurious to the canvas of a painting, which causes the greatest contraction or expansion, temperature, that is to say heat,—or moisture?—Both in succeeding each other rapidly would unquestionably materially affect the canvas. If canvas were to dry up with heat, and then suddenly, by change of temperature, to become moistened, it would slacken or loosen, as it were.

210. Would not it become tighter by moisture?—That would depend very much upon whether it was well wedged up. We often find pictures cockle, and are obliged to wedge them up.

211. Yes, but the question is of the effect of moisture upon canvas?—If there is a lump upon a picture you have only to moisten the back and you recover the surface.

212. I think you said you had a picture by Danby which you thought had been painted with asphaltum and varnished eight years ago?—The picture I said was varnished eight or ten years ago was by Thompson of Duddingstone.

213. Well, it was a picture in which asphaltum was used entirely. Have you observed any deterioration in that picture since?—There has been no deterioration in that picture since the varnish was put on.

214. (*Mr. Redgrave.*) Are you sure, Sir Matthew, that it is painted with asphaltum, because it is a difficult thing to tell. I could not myself assert that the picture upstairs by Thompson is painted with asphaltum?—I do not assert that it is. I do know it was Thompson's habit to paint latterly in asphaltum.

215. (*The Chairman.*) Are you aware that the paintings in this Museum are lined with painted cloth at the back?—I am not aware they are so. I should think painted cloth might be a good thing or not. It might be better than paper, and it very likely would be.

(*Mr. Redgrave.*) They are all covered with painted cloth to keep them from any damp or dust from behind. They are covered on the

Sir M. W.  
Ridley.

March 1866.

outside of the stretcher, leaving the thickness of the stretcher between the two canvases. I am speaking of the Sheepshanks pictures.

216. (*The Chairman.*) I think, Sir Matthew, we shall soon be able to sum up. You objected to the heat, and now you speak about your doubts as to whether a collection of pictures would long bear the admission of the public at night in any such building as that at South Kensington, in similar circumstances. What would be your practical recommendation—would it be the exclusion of the public or the alteration of the building?—I do not desire the exclusion of the public, but I think that some of these public institutions might be too much open. I think that there is, as you will be aware, at night, to a certain extent, a risk, it may be small, of explosions, which, though not frequent here, when they arise, are very calamitous. I should say this, that if the gas in any national gallery was so placed as that it was possible for that which escaped from it to rest upon the surface of the pictures, that alone might be sufficient to say, "You cannot go in at night, for we cannot have the national property destroyed." I do not say that under ventilation you might not carry off all these impurities outside into the atmosphere, and I am very much disposed to think that so far here, the gas being so high, the sulphur does get away. It is so high that I do not think it is likely to coat the pictures, but at the same time the gas gives a very strong light, and there are one or two pictures which are very much cracked, one in which the head is all gone—by Hilton.

217. From the gas?—No, no, excuse me, it is in that condition, and I think its exposure so near the gas as it is now might be detrimental. It is very much fluxed.

218. Would not what you call fluxing be rather due to the heat than the light of the gas?—It would be due to the heat, but the sun's heat fluxes these pictures; a strong heat from gas will also do it. If you were to hang a picture over that mantelpiece with a candle near it, or even lamp with a shade, and have the light flickering up and down, in a certain period of time at either end of the picture you would find a smoky discolouration or drying going on which is not quite comfortable.

219. What is your objection to the admission of the public at night. What is the objection on which you lay the greatest stress?—I do not wish here to go into the question that I might entertain regarding the admission of the public night by night into the public galleries. If you mean that, that is a question I am not come here to answer. I can only answer it one way—I should object to it if much dust and dirt and that sort of thing were accumulated by their entrance.

220. I should never have raised the question had it not been stated here distinctly in one of your own paragraphs, "I entertain grave doubts whether any collection of pictures would long bear the admission of the public at night in any such building as that now at South Kensington, under similar circumstances." This gives the weight of your authority?—My authority is not of great weight, but I confess that I thought then, and I still think, from having been here the other evening, and on previous evenings, that there will arise a great deal more dust and dirt by keeping them open in the evenings, and this must necessarily come down upon the surface of the pictures. In point of fact it will smutch them. I do not say anybody will touch the pictures; it is not that I am afraid of; but the pictures will be less clean, and will be at a disadvantage from being in this state. At night the dust must rise and deposit itself on the pictures.

221. Do you think that that might be counteracted by glazing?—You certainly would get that dust on the glass instead of the picture.

222. So that that injury would be remedied?—Assuming that you do

Sir M. W.  
Ridley.

glaze. I have not said that in my opinion it is desirable to glaze pictures.

223. No, I know you have not said so, but you have seen no evidence against it?—I gave a qualified opinion, and it was qualified because I cannot back it up with my own practice, as regards my own, for I have but one picture that is glazed, and that came into my possession glazed. It is an old master.

224. Suppose we assume for the sake of argument that glazing would not of itself injure a picture in any way, then do you not think that glazing would tend to counteract the evil arising from the deposition of smut and dust?—Glazing would unquestionably prevent the soot resting upon or reaching the surface of the picture. You would simply have to remove the dust from the glass, and it would be removed from the picture.

225. I trust we shall have no difficulty in coming to some practical conclusion here. If a single individual walks through a picture gallery he raises a certain amount of dust, and it is therefore a simple question of numbers. If you diminish the number of course you diminish the dust. Now, is it your opinion, taking things practically as they exist, that too many people are admitted into these galleries at night?—No, I do not say that too many are admitted. The numbers are very large. In my opinion, certain of those pictures, except under very favourable circumstances, are not likely to last very many years; but I am not prepared to say that the admission of the public at night will really accelerate their decay. I am of opinion, that no handling and no treatment will ever reinstate those pictures, under whatever circumstances the original damage to them arose. I do not think their real duration will be much affected by the admission of the public at night.

226. Then you have changed your opinion since the time when you expressed "grave doubts" as to the capability of the pictures to stand the admission of the public at night? What change did you wish made when you expressed those doubts?—My grave doubts were in part created by the impression I had upon my mind of the gas being at a lower elevation than I see it is, and I no longer apprehend—certainly not to the same extent as I then apprehended—that the impurities of the gas will settle upon and crust the pictures; therefore my opinion thereon is to that extent modified.

10 March 1866.

R. N.  
Wornum, Esq.

10 March 1866.

RALPH N. WORNUM, Esq., Keeper and Secretary of the National  
Gallery, examined.

227. You have paid attention to the temperature in the South Kensington Museum?—I find by this return [*return examined—see Appendix G. 4, p. 101*] that the variation within 24 hours has been as much as  $26^{\circ}$ , which is an enormous variation. (See foot note on p. 101 of Appendix.)

228. Have you considered the state of the rooms here in which the pictures are exhibited, with regard to lighting, heat, and ventilation?—I have repeatedly complaints of the wonderful cracking of the pictures at South Kensington, and am repeatedly asked “What is the explanation?” One may beat about the bush for a long time and never hit the right thing, but I have always suggested that it must be chiefly the great variation of temperature which takes place here. It was owing to this suggestion of mine that the return was made. I find in one case the variation was as much as  $26^{\circ}$  in 24 hours. There is as a rule chiefly greater variation in the temperature here in one day than we have in Trafalgar Square in the whole year. The highest marking in summer and the lowest marking in winter at the National Gallery do not show a difference of more than  $20^{\circ}$ . The lowest reading I have ever observed there has been  $47^{\circ}$ , and that has been in the room near the door. The highest point I have observed, but I would not be sure about this, is, I think,  $68^{\circ}$ . I have not entered that. I asked one of the inspectors what was the highest reading he had ever observed, and he said  $67^{\circ}$ . That gives us, between the highest in summer and the lowest in winter, a difference of only  $20^{\circ}$ ; whereas the pictures here are liable to a variation in winter of  $26^{\circ}$ , and that takes place within 24 hours.

229. What variation takes place in the National Gallery; what is the maximum variation in the 24 hours?—At night the thermometer stands a few degrees higher than it does in the day. We shut the windows at night and the doors are shut. In the day there is a slight draught, and it was in the room near the door where I observed the lowest reading,  $47^{\circ}$ . With the windows and doors shut at night the thermometer rises  $2^{\circ}$  or  $3^{\circ}$ , so that the variation between night and day can scarcely be appreciated, it remains about stationary. I have tried to find out what would be the average standing of the thermometer in the National Gallery during the winter, and it is about  $55^{\circ}$ .

230. Do you assert positively that there is a deterioration in the pictures at South Kensington?—Some crack wonderfully fast.

231. You observe great deterioration of certain pictures in a given time?—I observe that certain pictures go on cracking, but others do not crack at all.

232. Will you mention specifically the pictures that crack?—I mean more especially Sir Joshua Reynolds’ “Lord Heathfield,” the cracks of which I observe are much worse than they were a short time ago. Then Wilkie’s pictures crack very much. However, I do not suppose this cracking is entirely owing to the change of temperature. I believe there are two causes, the material with which the picture is painted and the exposure that it is subject to. These are the two causes. Many men’s pictures will stand. Sir Edwin Landseer’s are exposed, I believe, to the same changes and draughts, and yet they have not cracked; and there are a great many pictures in this museum which do not appear to be at all cracked, and yet have been here just as long as the Wilkie’s and Sir Joshua’s.

233. Have you noticed any asphaltum painted pictures that have not cracked?—I should say there could not be such a thing; they must of

R. N.  
Wornum, Esq.

10 March 1866.

necessity crack, because they never dry ; and if they do not dry and you get a quick drying varnish on the surface they must crack.

234. Do you think that it is due to variation of temperature and not a matter of varnish ?—The two act together. Some pictures are predisposed to crack, and if you give them a thing that will make them crack of course the cracking is accelerated.

235. If we kept a uniform temperature the varnish would still cause them to crack, would it not ?—I think any asphaltum or megylp picture, varnish it when you will, will be sure to crack a little in any room, no matter where it is, and that is a strong argument against ever varnishing asphaltum-megylp pictures.

236. Have you observed this cracking ?—I have taken several away and repaired them entirely, but they are now going again. I believe they would go in Trafalgar Square, but not so rapidly.

237. Were any photographs taken ?—There were some time ago.

(*Mr. Redgrave.*) There were two photographs made for Sir Charles Eastlake—one of Sir Joshua's Holy Family, and the other from Benjamin West's Last Supper. Colonel Scott has compared the Holy Family, and the going is so slight that he cannot perceive much change.

238. (*Colonel Scott.*) There is very little change. In one place it seems to have gone the other way. One crack is decidedly shortened. I should say there was no increase that could be seen by anyone who did not actually compare and measure the photograph with the picture.

(*Mr. Wornum.*) I think you can soon tell, old cracks are dirty, and new ones clean. I refer particularly to the right sleeve of the coat.

239. The Hilton failed in Marlborough House—did it not, the Sabrina ?—Yes, it ran down.

240. And the Swan-necked Lady ?—That was cracked in Marlborough House.

241. You cannot imagine any condition in which you can place that picture that would make it safe ?—No ; it does not depend entirely upon ventilation, that is certain. Landseer's do not crack, and Wright's of Derby do not crack.

242. How is the National Gallery warmed ?—By water, and we keep up the fires all night. The pipes run in recesses in the flooring the same as here ; but here you have also pipes just under the pictures, and that is the very worst place you could possibly put them in.

243. With regard to the propagation of this deterioration, do you think it would be arrested by bringing the pictures under a more constant temperature ?—Certainly, and by having a more gentle draught—letting the air into the galleries by smaller apertures than you do. The gallery here is sometimes like a tubular bridge ; there is a perfect torrent of air cutting through, and that must chill the pictures more than gentle ventilation would.

244. What might feel cool to you need not affect the pictures, need it ?—It is the rapidity of the current acting upon the pictures. An instance of this has happened lately at Trafalgar Square. We lately repaired a Cosimo Rosselli which was hanging at the end of the gallery. We had no room for it, and I put it in the hall. There is always a certain current of air there, and that picture has chilled enormously, because exposed to the current of air. A lesser current of air would chill less. I believe very often in the galleries here there is a rapid current of air rushing through.

245. Would not the temperature be better measured by a thermometer than by one's personal feeling ?—The chill is seen by eyesight. A bloom comes on the surface of the pictures which shows itself to the eye. You have a perfect bloom, just like the bloom on a plum, and that comes all over a picture.

*R. N.* 246. There is something deposited on the surface of the picture?—  
*Wornum, Esq.* Yes; it depends upon the varnish to a large extent, I think.

10 March 1866. 247. What I want to ascertain is the cause of that; is it a mere mechanical motion of the air, or the temperature?—I think it must be the motion and the temperature together, but I cannot say positively.

248. Do you think it is not damp?—I think it is not damp. The case of chilling I mentioned was an excessive case.

249. Is the temperature of the passage where this picture was hung lower than that of the room above?—No, sometimes it may be even higher.

250. The window at the end of the picture gallery here is never opened in the winter, is it?—Oh, yes; the window with the venetian blind is opened in the winter.

251. Is it a general opinion amongst artists, or at least gentlemen practically acquainted with pictures, that a current of air has this chilling effect?—Anything like a draught has. They say, “Never put your picture in a “draught, because it will be sure to chill it.” That is a common belief among artists.

252. I want to get at an idea of the physics of the thing; is it the mechanical motion of the air which actually chills the surface, by drawing a greater amount of moisture from it?

(*Mr. Redgrave.*) “Chill” is a technical term. What we call chill is very much like a bloom. It is something which arises from the varnish, that is unquestionable.

253. (*The Chairman.*) It is a bluish tint, is it not?—It is an infinitesimally fine division of the varnish.

(*Mr. Redgrave.*) I have seen it under all conditions in rooms where no motion of the air at all was taking place, but it is only on newly varnished pictures.

254. (*The Chairman, to Mr. Wornum.*) Then your opinion is that this draught promotes what is called a “chill”?—Yes, too much air causes chill.

255. Then you think there is too much air here?—Yes, I think there is. You let in too much at a time, the apertures are too large, your ventilation amounts to wind. We let in the air from below in the Italian room, at Trafalgar Square, but we have only six apertures about a foot square, and the fresh air comes into the troughs containing the hot pipes. Therefore it rises as warm air, but it does not rush at the people through a great window, as it did at the Great Exhibition building. The objection made here is that the air is a great deal too hot, and that this hot air is too strong for us. In the National Gallery we have no hot air, because our water generally stands at 130°, and it has to travel a long way and it is never very warm. What I call a high reading of the thermometer is 62°.

256. Now, Mr. Wornum, do you not think that the exclusion of wind would also be attended with disadvantage? Whatever impurities may be imparted to the air by the people in the galleries, if these impurities are not steadily removed they accumulate, and may affect the pigments. Have you found anything of the kind in the National Gallery?—We try to sweeten our galleries as much as we can, and we have plenty of air; but we always give orders that the windows shall be shut against the wind, and the air allowed to come in on the other side, on purpose to avoid the current of air. The old rooms open entirely round with windows; we do not give any supply of air from below except that which comes in from the doorways when open, or through the small apertures I speak of in the Italian room which are only six.

257. Do you remember in 1859 a specimen of painting being exposed in the National Gallery?—Quite well, I hung it up myself.

R. N.  
Wornum, Esq.

10 March 1866,

258. Do you know anything about the result?—I never knew anything of the result; I could not tell with my own eye whether it was worse or better.

259. There is a very strong statement here made with great deliberation by the Commissioners of 1859, who went very fully into this subject, and which bears very strongly upon this point of ventilation. They say that they exposed two specimens of painting, one in a common privy, and the other in the National Gallery, and when those two specimens were presented to them, that exposed in the National Gallery was more dirty and more injured than that exhibited in the privy?—I can explain that—in the privy there was no doubt a thorough draught running up from the back, and very likely the place was but little used, so that in point of fact the air was pure and good. The privy was in the country, and the air may not have been foul at all. The specimen in the gallery was hung in a bad place; we have a dark vestibule between two large rooms, and the vestibule has two doorways, and the current of air passes from one doorway directly to the other. The two recesses on each side of the doorway are not of course so well ventilated, and are besides dark, and this is where the specimen was exposed. I did not think of what the consequence would be of putting it there, but it was too bright to allow of its being hung near a picture.

260. How far do you think the blackening described here by foul air would be due to absence of light?—This vestibule is not light at all, because there is no window near it. There is a little circular painted piece of glass over the door, but there is not much other light there.

261. Then this white lead specimen was exposed in a dark place?—It certainly was in a dark place, and a place that was not properly ventilated.

262. At all events, we may infer from this experiment, Mr. Wornum, that want of ventilation may produce more evil effects than draught?—Well, I don't know about that. I suppose a want of ventilation produces evil effects.

263. Do you object to the position of the heat pipes?—I think they are in the worst place they can be in.

264. Is there anything else that strikes you as being desirable to be improved in the warming or ventilation of the galleries?—No, I think that, putting the matter simply, the heating apparatus should be in the centre of the rooms, and that the fresh air should be let in through small apertures, and not in any great rush or sudden change.

265. You would also recommend the preserving of a more constant atmosphere between day and night?—Certainly, I believe that is important; you should avoid sudden changes of temperature.

266. (*Capt. Donnelly.*) I think you said the maximum and minimum temperature at the National Gallery were  $67^{\circ}$  and  $47^{\circ}$ ?—That is what I have noticed.

267. Does it not rise above  $67^{\circ}$  in summer?—No, I have looked several times; the top is all open, but no sun comes in. Our rooms in the gallery in the summer are always about  $10^{\circ}$  or  $20^{\circ}$  below the temperature of Trafalgar Square. We keep the blinds down and the windows open, and there is a great current of air in all the old rooms, so that they cannot get very hot. When the air comes in it is cooled by getting out of the sunshine. I have noticed it  $20^{\circ}$  and  $25^{\circ}$  lower than the thermometer in Trafalgar Square.

268. (*The Chairman.*) That might be the case perhaps at the commencement of the hot weather, but after a long continuance of hot weather the air in the sun is not a whit warmer than the air out of the sun?—What is it makes the thermometer rise to  $94^{\circ}$  and much higher in the sun?

R. N.  
Wornum, Esq.  
10 March 1866.

269. That is the direct action of the sun upon the thermometer, not the action of the air; shade your thermometer and you will get the temperature of the air. The summer temperature of the air is usually considered to be about  $67^{\circ}$  in the shade; but if you allow it to come into your rooms in the National Gallery at  $75^{\circ}$  or  $76^{\circ}$ , as it is sometimes, I do not see how it falls to  $67^{\circ}$ ?—The air cools by not being exposed to the rays of the sun. Some interiors are comparatively cold in the summer.

270. The sun heats the earth, and the air is heated by its contact with the earth. This air enters your galleries.—You think a thermometer in the shade outside ought to indicate exactly what it is inside?

271. Unless the cold of the walls inside chills it.—I am certain our thermometer in the gallery has never stood on the same level as the thermometer outside in Trafalgar Square. It is constantly  $20^{\circ}$  lower inside than out, and I should be astonished if it were not so. The air inside cools in the night and has to be warmed again by the air from outside.

272. I should be rather astonished to find it  $20^{\circ}$  lower. When is the thermometer placed outside, is it against the window facing the north?—No, in the shade facing the south. There is a little cover to the thermometer, and it is in a glass tube. I will look particularly to this next summer.

273. (*Capt. Donnelly.*) Is there a regular register of the thermometers kept at different times?—We have a great many thermometers, but no register is kept.

274. The minimum of  $47^{\circ}$  is not taken at night?—That is about the middle of the day. Perhaps that same thermometer would be  $52^{\circ}$  at night.

275. It registers higher at night?—Yes, of course. To-day I went round and looked at the thermometers, the lowest was  $52^{\circ}$  and the highest  $61\frac{1}{2}^{\circ}$ , and that will be about the usual thing.  $52^{\circ}$  is very low, I should say. About  $55^{\circ}$  or  $56^{\circ}$  is generally about the average state of the thermometer throughout the winter; and it is  $10^{\circ}$ ,  $12^{\circ}$ , or  $15^{\circ}$  higher in the summer. I have seen it as high as  $68^{\circ}$ .

276. I should like to ask your opinion concerning the desirability or otherwise of placing oil paintings under glass?—I think it is of the utmost advantage. I do not see that any ill effects can arise, but a great many good ones may. We have got pictures that have been under glass for 35 years, and the frames are still clean and do not require any wiping or regilding, and the pictures are scarcely ever wiped. I believe that some of our pictures which are under glass go three or four years without wiping, but pictures not under glass must be wiped every fortnight or three weeks.

277. Then you would recommend the glazing of pictures, especially in large national galleries?—Yes, certainly. The dirt does not come in from the windows but from the people's feet. Before I was keeper of the National Gallery they used not to open windows there, but little ventilating panes, which let out so little dust that it accumulated on the pictures, and since we have taken this away and opened 13 large ventilators there is comparatively little dust which rests upon the pictures. By the circulation of the air the dust goes out at these great swing windows. These windows are very large, and almost always open when the people are in the rooms. I found that was the chief effect, taking away the dust, which was a terrible nuisance to us before. If we neglected to dust any frame for a day it was covered with dust, and now we can leave them for a week.

278. How can you account for the great differences of temperature alleged to exist here?—You have a difference here, it may be caused by the gas or not keeping the fires up during the night, or by too violent ventilation to carry off the effects of the gas. I have been in the National Gallery at 12 and half-past 12 at night, and the thermometer is always a little higher than during the day.

279. But you keep no register of the thermometers?—We do not keep any registers day or night. The men are told to keep the fires according to the thermometer, and they poke the fires or not to keep the thermometer at a proper height.

280. Then we have no documentary evidence to appeal to?—No, I have observed the thing myself. All the police look at the thermometers, I tell them to try and keep the thermometers at 57°, and they try to do it.

281. May I ask you whether you consider 57° the best temperature, or what is best?—I think 57° an exceedingly good one, I should say 55° was a good one.

282. Do you find the students like 57°?—I should say their average was about 56°, it is sometimes higher, sometimes lower. I hear of very few complaints, except from occasional draughts.

I asked to know whether we in keeping it here at 60° are keeping too high a temperature.

(Chairman.) I think 60° is a moderate temperature.

(Mr. Redgrave.) The students complain that at a lower temperature than 60° they are not warm enough.

(Mr. Wornum.) Here is a little report given to me some time ago. It is the only one sent me, and is dated May 4th, 1861. In the Turner room the thermometer marked 59°, and in the Vernon room 79°; so that there was a difference of 20° in two different rooms. The last thermometer was on frame 345. (With reference to this evidence, see foot note.\*)

283. By whom was that taken?—Mr. Paine.

284. Were the two thermometers taken at about the same time in two different rooms, or was one taken at one hour of the day and the other at another?—59° was taken at half-past 10, but he does not put the other time, it was during the day.

285. Then you deprecate the sudden variation of temperature?—I should say the chief cause of mischief is the variation of temperature.

286. Was the Wilkie that has lately been repaired varnished afterwards?—Yes, it was, and it is now, I think, cracking worse than ever.

287. Is there anything else you would like to mention?—If you want information from me I think you must draw it out of me. I think it is important to see that you do not keep the water over hot, and not keep the thermometer very high and never let it be very low, and also try to keep the rooms sweet. We have a ground-glass roof and lift-up the ground-glass frames, and then the windows in the roof are opened,

\* Extract from register of thermometric readings in Vernon and Turner rooms respectively, on Saturday, May 4th, 1861:

Maximum temperature of three rooms with thermometers in each—Vernon, at 11 a.m. 64°, at 3 p.m. 65°; Turner, at 11 a.m. 65°, at 3 p.m. 63° to 64°.

Minimum temperature of three rooms with thermometers in each at 11 a.m. 63°, at 3 p.m. 63°. Same temperature in Vernon and Turner rooms.

Maximum (bottom of paintings) temperature of three rooms with thermometers in each—Vernon, at 11 a.m. 65°, at 3 p.m. 65°; Turner, at 11 a.m. 65°, and at 3 p.m. 66°.

Maximum (top of paintings) temperature of three rooms with thermometers in each—Vernon, at 11 a.m. 65°, at 3 p.m. 65°; Turner, at 11 a.m. 65°, at 3 p.m. 66°.

R. N.  
Wornum, Esq.

10 March 1866.

*R. N.  
Wornnm, Esq.*

10 March 1866.

but this room is not so well ventilated as the other rooms where the blinds are. There are no blinds where the ground glass is.

288. Is there any difference between the preservation of the pictures in the two rooms?—I have never noticed any cracking going on in the National Gallery. The pictures are, as a rule, all old. We have Turner's now, however, but they do not seem to crack—at least they are not particularly cracked. They were a little cracked when we had them, but they do not seem to be changing, and I think that is because the temperature never changes to any extent.

288a. But the Turners here I am informed are not cracked.

(*Mr Redgrave.*) No, our present Turners are not cracked.

(*Mr. Wornum.*) Our water is in rather large pipes, not small ones. I do not know whether there is any advantage in that—whether you get as regular heat from a number of small pipes, as from a small number of large ones, the small ones must lose their heat more rapidly and be more difficult to keep at a fixed temperature.

(*Mr. Redgrave.*) We are rather going on the principle of putting a large number of small pipes lately, I think.

288 b. (*The Chairman.*) Do you cover the backs of the pictures, Mr. Wornum?—Yes, all are covered with artist's canvas primed.

288 c. And they are treated similarly here, are they not?—Yes, everywhere.

South Kensington Museum, 21st March, 1866.

PRESENT :

PROFESSOR TYNDALL, F.R.S., IN THE CHAIR.

DR. PERCY.

DR. FRANKLAND, F.R.S.

LIEUT.-COLONEL SCOTT, R.E.

CAPTAIN DONNELLY, R.E. (Secretary).

Mr. C. BUTTERY examined.

*Mr.  
C. Buttery.*

21 March 1866.

289. Have you had long experience of the pictures in these galleries?—Not in these galleries, but I have in most of the galleries.

290. You have been through these galleries often no doubt?—Not very often I am sorry to say. I am so occupied that I have not been able to do that much.

291. Then you are not aware of the conditions of temperature and ventilation that exist in these galleries?—I have not paid much attention to that matter. I am more of a practical man. I can tell when I have to subject a picture to any degree of heat how much heat it will bear. I have attained that knowledge by long practice, but I have not scientifically paid attention to the subject.

292. When you say you know what heat a picture will bear, you mean, I suppose, that you judge by your feelings?—Simply by my feelings. In cleaning pictures they sometimes have to be subjected to heat, but as to the degree of heat they will bear I rely entirely upon practice.

293. Can you say whether the pictures in the galleries here are getting worse; are they deteriorating; or, as far as you know, are they pretty constant in their condition?—Well I should rather fancy that it has been accelerated lately.

Mr.  
C. Buttery.

21 March 1866.

294. That is, the deterioration has been accelerated?—Yes, that they are more inclined to crack. I should like to give my reasons for that, so as to obviate it if possible.

295. You would like to give your reasons for what you have now stated?—Not so much reasons for what has taken place as for obviating the deterioration in future, according to my humble opinion; of course I do so with all submission.

296. First of all, then, Mr. Buttery, you say you think the pictures have been cracking more of late?—I think they seem to me to have got a little quicker on to the state of cracking than they formerly did.

297. You have observed them of late, have you not?—Yes.

298. And it is on this observation that you found this opinion?—Yes.

299. How long is it since you noticed that tendency to crack which they did not show before?—That I can hardly say; perhaps two years.

300. But you are pretty sure there is a tendency to crack in them now that they did not exhibit some years ago?—Yes, I feel certain of that almost.

301. Have you formed any opinion or idea in your own mind as to the cause of that—we are desirous of getting at the cause of these things that we may if possible obviate them?—I am very diffident about saying a word about it, because I know if I had my career to go over again, there is nobody who would better relish going through these galleries than I should, and anything I might say that would militate against their being opened would be against my wish. Still I am inclined to say the pictures have cracked more latterly than formerly. I speak more particularly of some pictures from the National Gallery to which I have paid most attention; the others I could not undertake to say much about.

302. Have you formed any idea in your own mind as to the cause of it?—Well, I should almost conclude that it was perhaps from heat.

303. You spoke as a practical man of having something to suggest as to the best means of obviating this injury to pictures?—I suppose I need not tell you that most pictures painted in England are painted with megylp, oil, and varnish, and that sort of thing; and I think the heat gets into the colour and remains there latent until all at once the paint begins to melt. That is my opinion.

304. The heat gets into the colour?—The heat that is passed from glass or anything else gets deposited on the surface of the colour, and remains in the colour in a latent state, and then by degrees melts it, and that is one reason of pictures cracking very much. At the same time I think they would crack almost without that. It is impossible for any man to say what pictures will crack and what will not.

305. I suppose megylp is a substance that cracks even when you bestow considerable care to avoid cracking?—Do you mean in the painting of pictures?

306. After the picture is painted. Megylp does not require extraordinary heat to make it crack; does it not crack in private collections?—I could not say.

307. Nor how much heat it would require?—It is a fancy of mine that the heat may operate in this way.

308. Are many of the paintings here painted in megylp?—Well I think the general mode with painters is to use megylp as a vehicle. There are many pictures painted in what I should technically call a very conscientious principle, with scarcely any medium of any description.

309. And do they stand?—Well, I think they stand best.

Mr.  
C. Buttery.

21 March 1866.

310. When you say no medium, you except oil?—No thinning material is used; just as the artist's colours are prepared so he will use them, without any diluting medium; and the pictures painted in this way I think stand best.

311. You were going to suggest something about the best method of preventing this cracking?—I have tried a picture with glass in front of a fire, being desirous to know how far and how long it would take for heat to transmit itself through the glass of the picture, so as to be able to test it. I put at the back of the picture a sheet of cream-laid paper (you know if you fold cream-laid paper you can do it without making a crack in it, but if it is heated at all the paper will crack directly), and after being an hour and a half behind the picture, the paper on being folded cracked, showing me that the heat had gone right through, which was what I wanted to ascertain. Then, to let the heat away, I think a current of air should pass between the picture and the glass. That would be a grand thing to do in my opinion.

312. A current of cool air?—Yes. When a picture is put into a frame, the glass is put before it, and there is no draught between the picture and the glass; and, therefore, whatever heat is transmitted through the glass, remains. But when there is a place filled with heated air, and an aperture is made admitting cold air, the cold will rush in and displace the heat; and, therefore, instead of having the glass as it were hermetically sealed when in the frame, it should have about so much (*illustrating*) open for admitting the cool air, so that a current of air would constantly pass through. This would do away with any hot air remaining between the glass and the picture.

313. Yes, but that would seem to do away with the very utility of the glass, for I suppose the use of the glass is to protect the painting from dust. Now this current of air you would introduce between the glass and the painting would undoubtedly carry dust along with it?—It would not allow it to rest. Of course it would require constant watching, and if the dust were at all appreciable, the pictures would require what we call polishing, which removes every impurity. I would engage to say, that with a few silk handkerchiefs I would keep a whole collection clean for any length of time, by breathing and just rubbing. A picture preserved in that way will keep in a most perfect state possible. It is like polishing a piece of wood. The pictures assume an appearance perfectly beautiful compared to those that are not done so.

314. I understand you to say that within the last two years the pictures have shown a tendency to crack, that you think that tendency is due to the enclosing this warm air between the glass and the paintings, and you would recommend that a current of air pass between the glass and the paintings, so as to remove incessantly that warm layer of air?—That is an impression of my own mind. I should like to have it experienced upon for the purpose of testing it.

315. Now we pass on to pictures not glazed; they appear to have been suffering like the others, I suppose?—Just as bad.

316. Have you thought of any other means of preventing their decay or injury?—When a picture is varnished and shows a disposition to crack it is quite clear there was something in the state of the picture when it received the varnish that caused it to crack, because some varnish will not crack. It is due perhaps to the temperature in which the pictures are hung. You need not wait until a picture is cracked all over, but as soon as there are symptoms of cracking, the varnish should be removed directly and another coat put on. Some pictures will crack in a remarkable manner, not merely varnished but those unvarnished. I have known greater evils arise to pictures not varnished than to var-

Mr.  
C. Buttery.

21 March 1866.

nished. I have known delicately-painted pictures with a beautiful glowing and tender horizon permanently tinted by some tainted atmosphere ; whereas, if it had been varnished, the varnish would have received that tainted atmosphere, and it would have been innocuous to the picture. Good varnish is removable at any time ; but scraping the upper surface, and getting rid of it in that way, would, of course, destroy a picture.

317. Then you would recommend, in all cases where there were signs of giving way, the removal of the varnish ?—Yes. When a picture begins to crack it ought to be stopped. If it is cracked in a corner, if you begin to examine the base of the crack you will find it wider at the bottom than at the top. That shows me the air gets into the crack, and ascending upwards wedges it open. That ought to be stopped. Those cracks that appear in pictures that have never been varnished are the worst cracks of all, for they sometimes run so close together that there is hardly a piece of the picture left. There are perhaps a hundred cracks in a couple of square inches.

318. Do you think that the unglazed paintings show a tendency to deterioration within the last two years ?—I have not looked at them with the view of ascertaining that. I cannot say that. I should say it is in all cases better when a picture is glazed.

319. You recommend glazing ?—Oh yes.

320. Do you know anything about what is called chill—the chilling of a picture ?—I can only tell you what I think of it, and that is, after the picture is varnished, the best way is to let the chill or bloom come upon it, and let it be on as long as you can before you disturb it. The longer you let it be the better it will polish up afterwards. It is polished by breathing on it and rubbing with a silk handkerchief. When a picture is newly varnished you allow it to obtain that chill.

321. How do you do that ? How do you obtain the chill ?—It is out of our power either to stop or to make it. I do not know whether it would not be a proper term to use if I were to say it is something that exudes from the varnish. The same kind of bloom will settle upon plate-glass.

322. What colour does it give it ?—I do not think it possesses any colour.

323. What do you think it is ?—It looks like a fine dust.

324. Of a bluish colour, is it not ?—Yes ; on newly-varnished pictures it comes like the bloom on a plum.

325. Did you ever notice a difference between the lights and darks of a picture ; that the bloom was more on the darks than the lights ?

(*Mr. Redgrave.*) I should think it showed more on the darks from contrast, but I do not think there is any difference in the quality.

(*To the Chairman.*) No, I do not think there is either ; it depends wonderfully upon the colour it is on whether you see it or not.

(*Mr. Redgrave.*) It is unquestionably some exudation from the varnish, but it shows more on the darks than the lights.

326. (*The Chairman.*) So I should infer.

(*To Mr. Buttery.*) I notice a MS. of some notes in your hands ; do you intend those notes for our enlightenment ?—I am a very ardent worker, but am not clever at these sorts of things, and I merely made a few memorandums in case I should forget anything.

327. Is there anything else you would like to tell us with regard to the precautions to be observed ?—I think a person ought to be deputed to look at every picture in the collection, and notice any little crack, and the moment it shows that moment to stop it, because I am con-

Mr.  
C. Buttery.

21<sup>st</sup> March 1866.

vinced that the air acts as a sort of wedge, for when a picture begins to crack it goes on to others, but if the cracks are stopped they do not extend.

328. Have you repaired any of the National Gallery pictures?—Yes.

329. Were they pictures painted in megylp?—Painted in megylp and other vehicles besides.

330. Was asphaltum at all used in their painting?—Very largely. Bitumen is very much the same thing, but there is a difference.

331. When you repaired them were they varnished?—I cannot remember each picture.

332. Were some of them varnished?—Have you any question to ask upon any one particular picture, and then I can tell you.

333. I want to know what effect this asphaltum or megylp had upon the varnish?—The effect of asphaltum is that it never dries.

334. But in those pictures that you repaired do you not remember whether those painted with asphaltum were cracked or not?—Oh, yes; they would not have come into my hands if they were not; and one in particular, the "Synagogue," by Hart, that was cracked so that only about three or four figures could be distinguished.

335. What did you do with that picture?—Filled up the cracks and revarnished it.

336. Did you fill up the cracks with varnish?—No, stopping. The asphaltum cracks are deep, like a canal, running in all sorts of ways. We fill those up, get an even surface, and then restore the work.

337. Now, what is the result in these paintings after you have filled the cracks?—I have not seen the Hart yet, but I have great hopes myself that it will be successful. I invited Mr. Hart's attention to it, and he seemed pleased with the mode in which I had succeeded. But he added, "You will never succeed, for it will go again." I said, "Why?" "Oh," he said, "I was infatuated, like Wilkie, and we all fell into a state of asphaltum, and I was so enchanted with it that I assure you that picture is painted upon a sea of asphaltum, and it will be sure to go. I spread it all over."

338. Do you know any means of preventing pictures of that kind from cracking?—I do not think there are any means.

339. (*Mr. Redgrave.*) I should like to know whether the "Synagogue" was cracked when it was in Marlborough House; do you recollect?—I rather fancy I saw it there, and it was a goodish deal cracked then. It is the pictures painted with asphaltum that are more inclined to crack of course, and they will crack in almost any position.

340. May I ask you whether you varnished those pictures after repairing them? Did you varnish the "Synagogue"? Did you varnish he "Peep-o'-Day Boys"?—Yes.

341. And you know the state of one of those pictures?—That is why I should recommend being left to my own discretion with regard to the pictures. The moment I saw it beginning to crack or re-crack—and the whole extent of the re-cracking would not have been the length of this (*a lead pencil*)—I should have removed the varnish then on. I should like to make an extension of a remark I made just now. You may varnish a pair of pictures painted at the same time with the same varnish under exactly the same circumstances, and one will crack and the other not. The moment it begins to crack the varnish should be removed and varnished again until it will not crack.

342. Is the varnish still on it?—On three different occasions I solicited to have the picture sent back to me to have the varnish removed again; and if I may be allowed to make use of Mr. Redgrave's name now I

21 March 1866.

shall be glad, because it appears to me that the older one gets the wiser one becomes. He has said, and I now agree with him, that in some cases pictures, and particularly modern pictures, should not have more varnish upon them than is necessary, and in some cases none at all.

343. (*Mr Redgrave.*) That is merely in reference to pictures which you repaired for me, and has nothing whatever to do with this inquiry. Wherever you have repaired pictures for me you have always abstained from varnishing them at my request?—Latterly; and I saw no harm in the varnish until this “Peep-o'-Day Boys” became so unfortunate, but that is upon a sea of asphaltum.

344. (*The Chairman.*) You have not paid much attention to the heating of the galleries?—I have not.

345. You have paid attention only to the effect of heating by exposing the pictures in front of the fire?—That is all. It came into my head to do so to ascertain how far the heat would penetrate through the glass. Then I thought there ought to be some mode to allow that heat before it is generated to be sent away.

346. Then with regard to glazed pictures, you would prefer a moving atmosphere over the surface of the painting to a still atmosphere?—Yes, I should.

347. Would you varnish modern British pictures or not?—I should do so, rubbing the varnish as thin as possible.

348. (*Dr. Percy.*) You spoke just now of what you call getting up a picture occasionally, and then exposing it to heat, I think; am I right in understanding that?—I merely said I had never paid any attention to a scientific mode of heating.

349. In the getting up of pictures you said you put them before the fire?—Yes, by putting a picture before the fire I know whether it is safe or not safe.

350. Have you observed any sensible difference in regard to the preservation of pictures in different galleries, especially in London?—Do you mean with regard to these galleries here?

351. No; irrespective of these altogether, is it within your observation that the pictures in some galleries in London have been better preserved, say, than in others?—No, I have not noticed that particularly; I have noticed the same tendency (going in as a casual visitor) to crack anywhere.

352. I want to know whether you have observed any difference in the preservation of the pictures—that is, have they been preserved better in one gallery than in another?—I could not say that at all, because I have seen pictures in the Grosvenor Gallery to which I called the attention of the gentleman who had the care of them; one picture especially was in such a state of awfulness all over that he was obliged to me for calling attention to it. Cracks will occur everywhere.

353. Have you ever had any experience of the new process, Captain Pettenkofer's process?—I have never tried it.

354. Have you ever seen the result of the trials?—I know they dare not try it upon English pictures.

355. Do you speak from experience or your opinion?—It is my opinion, from the nature of the varnish used.

356. I think you said you had noticed some instances of glazed pictures having suffered from heat?—Yes, but I think I said at the same time, or qualified it afterwards, that I have noticed pictures crack just as bad without glass as with it.

357. In the case where you have noticed this cracking which you believe to arise from the excessive heat between the glass and the picture, do you remember what sort of exposure that picture had; was it

Mr.  
C. Butterly.

21 March 1866.

in such a position as this?—I have not made any particular observation with regard to any particular picture being glazed or not glazed; the reason I threw out the suggestion was that there should be no chance of it in the future.

358. Then you have no particular case in your mind as to pictures glazed that suffered in that way?—No, I cannot call to mind any one instance in one way more than the other.

359. This experiment you tried by placing paper behind the glass; do I understand the paper was placed between the glass and the picture, or behind the picture altogether?—Behind the picture, and the heat came through the glass; that is why I suggested a current of air between the picture and the glass rather than allowing it to go over the front and back, because no one can tell when a focus or ray of heat may be thrown upon a picture.

360. You have never noticed glazed pictures that have been exposed to direct sunlight, have you?—It is always considered very dangerous; that is a known thing. For instance, if a whole length picture was hanging there, and the morning's sun came and took one corner of it, it would make that picture go, glazed or unglazed.

361. Do you think, from the pictures you have had to clean from here, that they are exposed to more danger in these galleries from any circumstances than they would be in any gallery you know of in London?—No, I should think not; I should say the arrangements are perfect with regard to ventilation, with the exception of this fancy dogma of mine with regard to glazing.

362. But that is the same in other galleries?—Oh, yes; they are all glazed in the same way.

363. They are not under worse circumstances here than in any other gallery, you think?—I should think not, certainly; perhaps they are even better.

364. You don't think much injury results from overcrowding here?—I think the more the better, but the pictures require the constant attention of breathing and wiping with a silk handkerchief. If some people were to breathe upon a picture of one foot square, if it has a coat of varnish, the settlement can be easily removed with a handkerchief.

365. With respect to pictures that are not varnished?—The wiping with the handkerchief would never hurt it.

366. It would be safer under glass, I suppose?—Oh, yes; decidedly. If a picture is marked with a stick or umbrella it can be removed by rubbing.

367. But if it was not varnished would not rubbing have a tendency to take something off in the long run?—There are two or three ways of rubbing; I can rub a picture so tenderly as not to injure it, or I can, by rubbing, remove the paint to the panel in a few minutes. I do not mean to do it as if I were scouring a floor, but just a light wiping.

368. How frequently ought that to be done in a gallery like this?—I could not say without trying it; I should say once a fortnight or three weeks.

369. If the people were talking and spluttering away in front of a picture, and the saliva settled on it, could you remove that as easily?—No, I should think not; glass would obviate that.

370. But I am speaking of one unglazed?—It would require sponging, which requires care.

371. If you think pictures can be kept as secure as possible by this means what is the use of glazing?—To prevent accidents.

372. Only that?—Well, I think there will be less chance of any

Mr.  
C. Butterby.

21 March 1866.

atmosphere resting upon a picture with a glass before it ; decidedly the chances are lessened.

373. Does this sponging process injure a picture ?—Not if it has got a good coat of varnish ; you cannot injure a picture by doing so ; but if there is the slightest crack, and sometimes they are so microscopical you can hardly detect them, you can wipe over the surface, but not the inner interstices of the cracks.

374. Then you are inclined to think the coughing and sneezing before a picture is a serious injury ?—Not a serious injury, because it is so easily removed by sponging.

375. This sponging is liable to cause injury you say ?—Yes, but there are two ways of doing a thing. It would be obviated by a glass.

376. Then, I suppose you would recommend that all pictures should be glazed ?—I consider that very desirable myself, for many reasons.

377. Do you think any injury is likely to result in a gallery from a current of air falling upon the face of a picture ?—I do not think any current of air would injure a picture.

378. Then, with regard to this thing called “chill,” you have no idea whether warm air, cold air, or what produces it ?—If I varnish a picture in London it will chill perhaps in three or four days, but if I varnish it at Goodwood it will be, perhaps, three or four weeks.

379. Then you never get this particular chilling except on varnished pictures ?—I do not understand you.

380. It is the varnish that chills ?—Oh, yes ; certainly. But any polished surface will get a bloom or chill ; any article of furniture, glass, or teacups, if left to stand still, unless wiped will get this kind of bloom upon them.

381. You think that is the same as the bloom upon pictures ?—I think it amounts to something of the same kind.

382. Do you think this bloom is a fine dust, or what do you think it is ?—I should suppose it was a very fine dust. With regard to the heating of pictures, I have made a short extract from *Chambers' Journal*, which, it struck me, had some bearing upon this question. It says, “ When a body is melting it retains a fixed temperature, however ‘ much heat may be applied, until the last particle is melted.’ There, I think, is the essence of the thing.

383. You have no knowledge of any extreme heat in these galleries ?—I should not think there is any heat there to hurt pictures.

384. (*The Chairman*.) Do you know whether any critical comparison of these galleries with others has been made, with reference to the very important point raised by Dr. Percy ; that is a critical comparison of these galleries with others ?—No ; I think the only test of comparison would be by the colours.

(*Mr. Redgrave*.) Certainly there are many galleries where it might be tested, where I do not think any proper thermometers are kept. It would be a very valuable thing both in public and private galleries to have such a test established for twelve months. It might be done in the Fitzwilliam, for instance, and other galleries.

(*The Chairman*.) Yes ; that is very desirable. Why this gallery should be singled out for adverse criticism is not clear, because the only justification of such comments would be upon a comparison of this gallery with other galleries, especially in London.

(*Mr. Redgrave*.) I think the great reason this gallery is singled out is because the pictures are all modern, and modern pictures suffer injuries, and fancy they arise from the gallery ; but that is not the case,

Mr.  
C. Buttery.

21 March 1866.

as it depends a great deal upon the mode in which the pictures are painted. That might easily be proved by reference to other galleries.

385. (*The Chairman.*) You mean with reference to the megylp and asphaltum. I do not quite understand whether Mr. Buttery thinks there are such rapid injuries taking place in the old paintings as in the modern ones?—If I had been allowed to make a remark I should have made almost the same observation as you made just now, that the only way to compare these galleries will be to compare the pictures with as many modern pictures elsewhere. It is not fair to compare a gallery of old pictures with one of modern. There are a good many of the English school in the National Gallery, Gainsborough's and Hogarth's.

(*Mr. Redgrave.*) There are at this time none of the English masters in Trafalgar Square, except Turner's.

(*Witness.*) The principal English masters have got into the way of painting in megylp; I do not think the Dutch school painted with megylp, as their pictures do not crack.

386. (*Dr. Percy.*) Do you know anything of the Italian school?—The tempera pictures of the Italian school are a different thing altogether.

387. I am not speaking of tempera painting, but of Italian painting. Do you find Venetian paintings crack in the darks?—Not particularly.

388. Not in the same way as modern pictures?—Oh no; I think the mode of painting differed altogether either from the Italian or Dutch schools.

389. (*Mr. Redgrave.*) But really the injuries arising to the modern English school are perfectly distinct from the injuries arising to the Italian and Dutch schools?—Yes.

390. And you think you can discern them at once?—I think so. I think it is very probable there are some pictures of the English school that will not crack at all during their existence. Many of those that do crack will be carried away and seen no more. This might have been the case in the Dutch or Italian schools; those that cracked may have been put out of sight, and those remaining are those that have kept perfect.

391. Have you observed any other works of art with cracks upon them?—Of what school?

392. Say the Italian school, if you like?—Oh yes; many of the tempera pictures will crack, particularly if they are not attended to properly.

I am speaking of genuine oil paintings; I do not understand your reference to tempera.

(*Mr. Redgrave.*) The early pictures, before the time of Raffaelle, were often painted in tempera; you can distinguish them from oil at once?

(*Dr. Percy.*) But tempera is not oil?

(*Mr. Redgrave.*) The distemper is varnished. But I think the question you put to Mr. Buttery, as to whether the old masters crack, should be clearly understood. There are various kinds of cracks easily distinguishable from one another. There is the hair crack, the asphaltum, and the megylp crack, which are perfectly distinguishable. The megylp crack is not so deep as the asphaltum and does not run so wide; and, therefore, when Dr. Percy asks you whether the Italian tempera pictures crack you say "Yes," but you mean hair cracks?—Yes; that is a different thing. I think a good deal of the cause of cracking is the bad canvas oftentimes painted on.

(*Dr. Percy.*) They prime canvas in different ways. In the olden times they used to have red grounds.

Mr.  
C. Buttery.

21 March 1866.

(*Mr. Redgrave.*) Sometimes, not always; the Dutch school used reddish grounds.

(*Witness.*) Many of the old painters primed their canvas themselves. The canvas is now stretched to the greatest tension on a large frame, and three or four coats of heavy size put upon it, and that is the priming to receive the paint for the ground. So that the damp cannot come to the front of the picture because it is oil, but it might to the back. I think the damp gets to the back, dissolves the size, and causes the picture to crack.

393. (*Mr. Redgrave.*) Therefore you would like them covered from behind?—I should like artists' colourmen to prepare their canvas with a thin coat of india-rubber at the back.

394. Would you be inclined to keep the pictures as dry as possible?—I do not think they ought to be too dry, sir.

395. Have you studied the effect of changes of temperature at all?—I have not, sir.

396. And you have no idea of the number of degrees of the temperature measured by a thermometer; you work practically, as you say?—Yes, sir; I think that cold never hurts a picture.

397. Supposing this room were suddenly reduced to freezing point and there were pictures here, do you think it would be injurious to them? I do not think it would. If a picture were hung in an ice well for 12 months I do not think it would hurt if it were well secured.

398. You think a sudden change from hot to cold would be injurious?—A sudden change might.

Mr. WM. COX examined.

399. I believe you have paid considerable attention to pictures?— *Mr. W. Cox.*  
Yes.

400. We are very desirous of getting as much information as possible regarding the condition of the pictures in these galleries; have you paid any attention to the pictures here?—Yes, a great deal; I have been here about four or five hours going over them carefully.

401. Lately?—To-day. Some time ago I looked at them with regret to see so many fine works cracking so much.

402. How long ago?—I suppose three or four years ago.

403. Do you notice any difference between your inspection of them to-day and your inspection of them three or four years ago?—Well, I noticed the cracks particularly have gone much further, and the Sir Joshua's are more cracked than they were. I also noticed that some of Etty's are going very badly, especially the large one of "Youth on the Prow and Pleasure at the Helm." Etty was one of our most solid painters, so far as my experience goes. His pictures want instant attention. I think the progress of the cracks might be stopped if they were lined; for in many cases judicious lining is a great preserver of pictures that are beginning to crack if they are taken in time. Now, there are three Callicott's, 340, 345, and 346, that I noticed particularly as wanting more immediate attention than any others. I think if they were lined and judiciously attended to the cracks might be stopped. I think these pictures will go to pieces if they are not attended to at once. And there is one Mulready called "Fair Time" which wants attending to. Mulready generally painted so well that I can scarcely account for that picture going unless it be on account of the peculiar situation in which it is placed. That picture is very much cracked, and I fancy also that all the Wilkie's seem to be spreading out more cracks go through the paint to the canvass.

*Mr. W. Cox.*

21 March 1866.

404. Do you happen to know the vehicle with which Wilkie painted these pictures?—Wilkie used more vehicle than Etty certainly. Etty painted more solidly than Wilkie. There is no doubt that Wilkie's pictures require more care than Etty's to prevent their cracking. Wilkie used a great deal of asphaltum, and also a great deal of megyl in his paintings, and the shadows are particularly liable to go.

405. Do you think pictures painted with asphaltum can ever be prevented from cracking?—Yes, I do.

406. Have any pictures come under your special notice that have been painted in asphaltum?—Wilkie painted in asphaltum, and he was the least experimental painter I know; he painted upon a principle, and that principle is apparent in all his pictures. I know several Wilkie's that are not cracked.

407. And you think they were all painted with asphaltum?—I only draw inferences. I did not see his palette; I think it is very likely he did paint in asphaltum. It is believed to be so by men of experience. But, nevertheless, I think that if due care be taken that the pictures are not too highly varnished, and not subjected to what I should call dry heat, they will stand for all time.

408. Are you acquainted with any pictures painted with asphaltum in private galleries in London?—I do not know I can say I am in private galleries in London. I think Miss Bredale has a Wilkie painted upon the same principle as the rest of his. It was painted at the same period as the "Blind Fiddler," or shortly afterwards in Wilkie's prime time, which began with the "Blind Fiddler" and probably ended with the Duke of Wellington's pictures. I believe you might have seen the Duke of Wellington's picture at Apsley House; that would be the best test as to whether the cracking is with the building, the situation, or the mode of heating it.

409. Is it not known to you that the pictures painted with asphaltum even in private galleries give way, crack excessively?—It greatly depends upon the usage they receive. I do not think they crack in private galleries anything like so bad as they do here. The "Rent Day" is in the possession of Mr. Chapman and I saw it not a great while ago, and it was a very solid picture.

410. You have been speaking of Mulready's pictures; now he is a solid painter, and yet you find his giving way?—Yes.

411. You are not able to compare your impression to-day with a former impression in regard to those pictures; you have inspected them for the first time?—I do not know that I have inspected them for the first time; when I have inspected them I thought it a great pity the hot-water pipes should be under the pictures, especially those of Wilkie and Mulready who are great men. The Mulreadys are not so bad as the Wilkies, and it is not likely they should be as they are more recent; but if they remained in the same places a few years longer they would perhaps be in as bad a condition, because the cracks are now going on, and that process of cracking, if not stopped, will go further. Many of the Mulready's have not begun to crack. I noticed that the large Landseer of "Wellington visiting the plains of Waterloo" is just begining the operation of cracking in some parts.

412. Your remarks upon Mulready are made from to-day's inspection; you do not compare it with former impressions?—No, my impression was that Mulready's were in a tolerably good state when I saw them before; and I see that one is cracked very much now.

413. Which is that?—"The Fair Time," 394.

414. Do you know anything of the history of that picture?—I do not, but I believe the background was painted in afterwards. I noticed the cracking of the heads more particularly.

Mr. W. Cox.

21 March 1866.

(*Mr. Redgrave.*) It was painted at two long distant periods, I believe and as much as 20 years apart; and one part may be painted in one way and another in quite a different way.

(*Witness.*) I think he may have touched a second time upon the heads, which would in some measure account for the cracking.

415. You think that what you call dry heat is bad for the pictures?

—Yes, certainly.

416. What do you understand by dry heat?—I mean heated water-pipes directly under the pictures, without any moisture in the atmosphere.

417. Do you know whether there is any moisture or not in the atmospheres of these galleries?—I noticed when I entered them that it appeared very close, although the thermometer was not up to more than 60°, and this I think may account somewhat for the pictures cracking. There is one strong case of cracking, and that is Wyatt's picture, which was painted at the same time as one that hangs in Sir Matthew White Ridley's collection. This latter picture has not a crack in it, while the Wyatt here is full of cracks. The subject is the "Philosopher." The Wyatt in Sir Matthew Ridley's house in Carlton Terrace is in a very fine state.

418. Have you any reason to believe that these cracks have occurred in that picture of Wyatt's since it came to this place?—I should say they had from my notice of it before; I was induced to notice that picture before from the circumstance of Sir Matthew having a large picture by the same artist with which I was acquainted.

419. What is the number of that Wyatt?—It is 384.

420. Then, what would you propose to substitute in the warming of these galleries for the property which you call dry heat?—My plan would be decidedly to admit warm air, which would come in at the centre of the galleries; and then I should have a ventilating apparatus, which should be in action in the day time and at night, because pictures are like human beings, they want light and atmosphere, and the purer you can get it the better. In the chilly days of winter you want an atmosphere not less than 56° and not exceeding 60°. That is the standard I think you ought to keep to in winter. Then, in summer, you ought to have such a contrivance that you can introduce cool air. Where you have a large amount of glass, of course the sun's rays come, and will sometimes increase the heat very rapidly, especially where there are so many people. I think the great object is to keep one universal temperature as far as you can, and to have a constant accession of pure air coming into the building. I think that is necessary for pictures.

421. What temperature ought the galleries to be kept at in summer, do you think?—Certainly not above 60°.

422. In summer?—Yes.

423. Supposing the air outside is at a temperature of 80°, that is 20° more, which is a very common thing in summer, would you introduce this air at 80°?—No, I should pass it through refrigerators. I should pass it into the building cool in the summer.

424. Is there any known gallery that is at the present time furnished with refrigerators of that kind?—Well, there is no gallery that I know of. I went yesterday to inspect one in order that I might be prepared with all the information I could give you with regard to ventilation, though I do not propose to go into that myself. The desideratum to be attained in all galleries is to have as large an amount of pure atmosphere as you can, just as you would for human beings, and to have the heat as far away and as universal as possible, and uniformly diffused.

*Mr. W. Cor.*

21 March 1866.

I cannot positively say whether the cracking of the pictures be due to their being placed over the pipes, but I say it ought not to be risked. You might arrange the rooms as you now have the large room where the cartoons are ; there I think the warming, the elevation, and the whole arrangements are as admirable as they can be.

425. Then you think if we substitute or recommend the same system of warming in the other galleries, that would meet your approbation ?—That would be approaching what I think is required, and what I say of the large room. It would be a great improvement. If you can by that plan get a constant supply of fresh air through the galleries in the summer, I should say that would be the best plan for the safety of the pictures in the galleries.

426. Have you thought of warming these rooms at all with open fireplaces ?—Well, there is nothing like open fireplaces to my mind, if you can manage the warming of the rooms sufficiently in winter and keep down the heat in summer. Where you have a large amount of glass, which you must necessarily have to get light, if you can keep these rooms cool enough it would be an improvement. Where there are a large number of people, the breath of those people acts upon the pictures, particularly those that are sweating, because all modern pictures undergo constant fermentation. The oil and matter with which they are painted is constantly coming to the surface, and if you have not some means to carry that off it clings to the pictures and will ultimately cause discoloration. Light and air are the two great essentials for pictures.

427. With regard to warming by open fireplaces ; would it effect the uniformity of temperature which you consider so desirable ?—No. The pictures that would be over the fireplaces would be subject to crack more particularly than those that were away from it. I had an instance of that only the other day. I found the picture of "Lord Lyndhurst's Family," which was always hung over the mantelpiece, was very much cracked. The "Death of Major Pierson" which you have in this gallery is not cracked at all, and they were both painted about the same time.

428. Then I understand you to say there are pictures in this gallery which fare better than pictures in private galleries ?—No, I do not. I say at present the "Death of Major Pierson" is in a good state ; and I have seen one of Lady Lyndhurst's pictures painted by the same man, but that hung in the late Lord Lyndhurst's house over the fireplace. Lady Lyndhurst accounts for its being so by its being hung over the fireplace. Certainly, any heat of that kind is injurious to pictures ; there is no doubt about it.

429. Do you not think changes of temperature injurious ?—Very.

430. More injurious than a uniform temperature ?—If it is a room you can sit in yourself, and feel comfortable and well in it, it will always answer for pictures. But I think the great evil that pictures experience, and particularly recently painted ones, is that the nights are cold. Our damp atmosphere in this climate affects them in the night, and then they are brought up to 60° in the day from freezing point at night. Where there are such treasures as you possess here, there ought to be, and it would be advisable to have, a universal temperature night and day, as uniform as possible. It could be regulated by having a night man, just the same as anything else, and you could get it up just as well. Upon the fan principle I saw at Baron Rothschild's, you bring in the fresh air heated as it comes in ; you have no occasion to have hot water pipes at all, the whole of the air being hot before it enters the room, and then being passed through cisterns of water you have the proper moisture with it ; it is not too dry. Of course I do not profess

to understand thoroughly what would be the best mode of ventilation ; but I know that the larger the amount of pure air you can get the better it is for the pictures.

431. But which do you consider the better, pure wet air or pure dry air ?—I should not consider either good. I want just as much moisture as is good for the human body ; what animals would live well in, that is the atmosphere for pictures.

432. How does the climate of Italy agree with pictures ?—It agrees with them very well.

433. You are aware it is much drier than our climate ?—Yes.

434. So that here at South Kensington we have an atmosphere much more humid than that of Italy. I suppose, then, as regards humidity, that we have enough of it ; therefore, what do you mean by dry heat ?—I mean in Italy you have a magnificent air—you can breathe in it and feel yourself well ; but it is not so here. I think so long as you have a constant accession of pure air, if you had a temperature at  $70^{\circ}$  it would not injure the pictures ; but according to the experience I have had, I think  $60^{\circ}$  is a nice atmosphere for pictures generally. Of course where pictures are painted in asphaltum, the lower the atmosphere these pictures receive the better it is for them ; but in the case of such solid pictures as those painted by Etty and others, they would stand a greater amount of heat.

435. Then you think when the air is as pure as it is in Italy, this dry air may be applied without injury ?—So long as the heat is alike all over the picture ; if you fry it on one side you will injure it.

436. What I wanted to come at is this—why do you complain of the dry heat here ?—The moisture of England is in excess of that of Italy, if moisture be essential, how is it the pictures in Italy fare so well ?—The pictures in Italy have also the benefit of the Italian climate.

437. Then you think that artificial moisture is necessary in our climate to neutralize its evil effects ?—I think myself that hot atmosphere supplied directly, as it is by the hot-water pipes here, under the pictures, is exceedingly injurious. It would, I think, be much better to introduce the air from hot-water pipes placed in the centre of the rooms ; and you should have a much higher elevation for the roof. Your roof ought to be at least 45 or 50 feet, so as to get rid of the sun's rays upon the pictures. I do not think it matters whether you have hot-water pipes or not giving forth dry heat so long as you have ventilating apparatus introducing pure air.

438. I do not think we should at all differ from you in regard to the position of these pipes, but you speak of hot-air ; how would you supply it ?—I think if you have those hot-water pipes at all, the heat should pass through water, in order that the air itself might not be so dry as it appears to me to be. There is a sort of oppressiveness here at  $60^{\circ}$ , that is what I mean.

439. I trust we understand each other. Is it not a curious thing that we should in England, where the air is already so moist, improve the air by making it moister ?—It is.

440. Your feeling of oppression might possibly arise from other causes ?—I think it is owing to the closeness of the rooms ; want of ventilation.

441. May it not be due to the direction of the wind ?—I do not attempt to give you information which you will be able to get much better in other quarters than I can give it you.

Mr. W. Cox.

21 March 1866.

Mr. W. Cox.

21 March 1866.

442. With regard to the modes in which those rooms are to be ventilated efficiently, can you give us any notion of the temperature the pictures ought to be subjected to?—I noticed just now in the large room where the cartoons are it was very comfortable to walk in, yet I noticed the temperature was only 54°, and the man there accounted for it because the ventilators at the top were open.

443. We know that ventilation will often answer when the wind is in a particular direction, and there are other times when it will not answer at all?—I do not know of any system of ventilation except by forcing pure air in, and having means of carrying it out. I think you use gas here. We know very well the gas in London is very impure, the worst in the world, I should think, and probably the best gas is at Liverpool, it being perfectly clean there. If you are obliged to light your galleries with gas you should have the burners between the roofs with the lights reflected in. Sulphur from gas is very detrimental to pictures, changes them, and in addition to that heats your rooms.

444. Have you any reason to believe that the sulphur from the gas here gets amongst the pictures?—No doubt it does.

445. On what observation do you found that statement?—On this ground, that unless you have means of introducing into a room fresh air the gas must necessarily affect the pictures. You can very soon test that by putting a looking-glass there, and if you want to test it further you can test it as I have done by having an artist to paint three pictures with the same vehicle and at the same time. Let him put one of them in a room where the gas is, let him put another where wax candles are used, and the third in a watercloset, and you will soon see the difference. I have in my pocket now a letter from Herring, the eminent artist. A picture of his was exhibited at the Great Exhibition of 1862 by Sir William Galt. He had taken great pains with that picture, and selected it to represent him at that Exhibition. It was at Sir William Galt's house subject to the influence of gas, and he writes me word that when he saw it a few months ago the picture was entirely ruined. None of his grays could be seen in it, and it was covered with incrustations which he was afraid had gone into the picture. I purchased this picture, brought it to my gallery, and took off that surface, and on Mr. Herring calling the other day he was perfectly delighted with that picture, because the incrustations had been removed without removing the scumming of the picture. Now, soap and water would not take the incrustations away, nor even touch it.

446. We are now speaking, Mr. Cox, of the effects of gas, the injurious nature of which I think is undisputed; but we have to consider whether there is any escape of sulphur from our burners in these galleries. No doubt if the paintings be exposed to the action of gas they will be deteriorated, but are you aware that some six years ago a commission sat here upon this very question, numbering amongst them such a man as Professor Faraday?—I was not aware of it.

447. That commission reported that no products of the combustion of the gas mingled with the air of the galleries. Would not the expression of that opinion by Professor Faraday and his colleagues lead you to reconsider the statement you have now made?—I should not at all recall it, because unless you have a system of ventilation to get rid of the heat the gas must cause an injury. I am quite satisfied that although there may be a less proportion, from the height at which your gas lights are situated, yet there will be a proportion of sulphurous impurity in the atmosphere; and I should say that, in spite of Professor Faraday, wherever you have gas introduced you have a certain amount of dis-

coloration of the pictures caused by that. I have seen the difference between pictures in rooms where there has been gas and where there has been no gas. In rooms where there is gas there is always an evil, particularly to modern pictures.

*Mr. W. Cox.*

21 March 1866.

448. Are you acquainted with the National Gallery?—Yes, I know it well.

449. What do you think of the ventilation of the National Gallery?—Well, I have not examined that part of it very lately; it strikes me as being very tolerably ventilated.

450. Better than the ventilation here?—Well, I have not made a comparison.

451. How is it lighted?—I do not know that it is lighted at all.

452. Not lighted at all?—I think not.

453. Are you aware that we have actually made an experiment here similar to what you have suggested—that we have had panels painted and exposed in private galleries here and in a watercloset?—You mean painted surfaces. Painted surfaces may be one thing, but when you come to the delicacy of the gradations of an oil painting there will be a great difference. A picture placed in a watercloset would go yellow unless it were a well-ventilated closet.

I believe we have made use of 16 of those exposed panels for two years, and they gave no indications of being injured by coal gas.

454. (*Mr. Redgrave.*) I suppose, Mr. Cox, you would not feel that pure white, such as an artist would use for his skies, for instance, would be a good test of change?—I should say pure white would be the best test. Having been a colour maker myself I think there are very few whites that do not change.

455. But supposing the same white were exposed under four different conditions, you would be able to test the changes, I suppose?—Of course.

456. (*The Chairman.*) I should like to draw attention to a fact here recorded by Professor Faraday, by which your proper suggestion regarding the exposure of painted surfaces in various positions is actually anticipated. They exposed one in the National Gallery, Charing Cross, and another in a country privy, and a third in the House of Commons, a fourth in the board room of Surgeons' Hall, a fifth in the Bridgwater Gallery, a sixth in the Royal Society's room, Burlington House, a seventh in the British Museum. Now, all these were more or less injured, and the most injured of all was the one exposed in the National Gallery. At the same time there were several pictures hung up in other places, one in Sir Thomas Baring's gallery, another in the British Institution, another in Lambeth Palace, another sealed up and kept in the Secretary's closet at South Kensington, another kept in a room in this building where absolutely no gas was used, another in the Sheepshanks Gallery, and all these eight pictures were perfectly unchanged?—All I can say is if that be so it is because sufficient time did not elapse to permit of a change beginning. That difference of atmosphere in those places will ultimately make a change I am certain.

457. The time was two years, however, and during those two years a great change had occurred in the painting exposed at the National Gallery, while there was no change in the painting here; does not that indicate that, notwithstanding the use of gas, we are here in a better condition than the National Gallery?—I think that is very likely. Taking it altogether, there is no doubt more care, better classification, and better attention here, but yet I fear you will lose your pictures if there is not something done to prevent the evils which exist. Of course

*Mr. W. Cox.*  
21 March 1866.

I am quite satisfied you will do all you can; but I am here to-day to tell you what I know from experience, and I am rather astonished to hear the account you give me of those whites having remained unchanged.

I am pleased to find we have actually anticipated the suggestions of a practical man like yourself.

(*Witness.*) I should rather the experiment had been with a picture, though I do not say pure white ought not to be a good test. I should like it put upon one of our absorbent grounds, a sort of canvas artists generally use now.

(*Mr. Redgrave.*) The paint was put upon such a board as we get from Roberson, they were Roberson's colours and were all from the same tubes. There were six or seven colours, white, vermillion, one or two yellows, ultramarines, and lakes which are most changeable.

(*Witness.*) If the colour was put upon these boards without the same vehicle that an artist in endeavouring to produce a light and shade would use—if you did not introduce oil in it—it was hardly a fair test of a picture.

(*Mr. Redgrave.*) They were all painted exactly under the same conditions, and there were great changes in some and no changes in others.

(*Witness.*) That might be because you got the colour on some in a state of perfection.

(*Mr. Redgrave.*) It was put on as it came from the maker.

(*Witness.*) It would no doubt stand better in that manner.

458. (*Mr. Redgrave.*) Perhaps you are not aware that Leslie did paint his pictures so?—I am not aware he did. I think you will find Millais will stand in that way, because he uses as little vehicle as possible. The less vehicle is used the more likely will the picture be to be affected by outward circumstances. You may put it in impure air and it will not be affected in the same degree as a picture that is softer.

459. (*The Chairman.*) Am I right in understanding that you would remove the water pipes from under the pictures?—Certainly.

460. And that you would effect as much displacement of the air as possible, so as to prevent the oppressiveness you felt in coming into the rooms?—Quite so.

461. You spoke about these Callcotts, Mr. Cox, and said, "If they were judiciously treated," I suppose you mean to imply that they are not so treated now?—Not at all. I mean judiciously treated in the lining—there is a great deal in that.

462. You said that pictures painted in asphaltum can be preserved from cracking?—I say you may prevent their cracking so far as when they are improperly used. They can be preserved by being put into a proper atmosphere.

463. Have you so preserved your pictures that have been painted with asphaltum?—I have.

464. Have you varnished such pictures?—Well, very slightly indeed, a very thin coat of varnish.

465. You said that a certain picture or pictures of Wilkie's that you had seen had not cracked?—Yes.

466. How have those pictures been preserved, where were they kept?—Well, they have been kept in a gentleman's private rooms in the two or three instances I know, and I believe they are never much varnished.

467. Could you mention the subjects?—One is the "Rent Day," in Mr. Chapman's possession, and the other is a picture in the possession

21 March 1866.

of Mrs. Bredale ; it was, I think, exhibited not long ago in the British Institution.

468. (Mr. Redgrave.) Are you sure the "Rent Day" was painted in asphaltum ?—I should say it was painted in the same manner as the one I saw here. Although I am not quite clear as to the date, yet I should say, from the mode in which they are treated, they were painted about the same period. I should say the "Rent Day" and the "Village Festival" were painted nearly at the same period.

469. You are not aware that they are painted in asphaltum, you are not sure of it ?—I cannot say that I am.

(Mr. Redgrave.) But we can say ; you will find his mode of painting stated in his diary.

470. (The Chairman.) You say you have seen one at the Duke of Wellington's ?—Yes, but I have not seen it for a long period ; it would be a fair test to see that.

471. (Mr. Redgrave.) You have seen the John Knox ?—I have seen it.

472. Are you aware whether it is in a good condition ?—He painted that after he had been to Spain and seen the Velasquez, and he might, in order to get the depths of colour used in the Spanish school, have used some of the mediums that are very destructive to pictures. I think Mr. Naylor has got that picture.

473. Can you suggest any means of stopping the progress of the cracking of asphaltum-painted pictures ?—Yes, I can ; the same means that causes them to crack will get them back to what they were ; and then, if you keep them in an atmosphere never above 60° or below 50°, you will find they will, when put right, remain so ; that is I think very likely.

474. You say "very likely," have you any positive knowledge ?—Yes, in one of Fraser's pictures I have ; by carefully managing it, I got the cracks nearly closed, and he was a very difficult man ; his pictures were often painted with a large amount of vehicle.

475. How long a time have you observed this picture you are speaking of ?—I have known it for years, when it was in Lord Northwick's possession.

476. With regard to dry heat, your chief objection, so far as I can make out, is not to the hot-water pipes so much as to the position of those pipes ?—More particularly to the position.

477. Have you any objection to that mode of warming ?—I have not, so long as you have the means of getting sufficient pure air into the rooms.

478. You spoke of an objection to the heat here because of its dryness ?—Yes, it will be quite possible to introduce moisture into the air. It is done at Baron Rothschild's ; there is no difficulty about it.

479. Will that obviate your objection ?—Even then, I should not like it directly under the pictures. If you can introduce moisture and fresh air, then I shall have no objection.

480. Is it that you have an objection to hot-water pipes wherever they may be placed ?—I do not object to hot-water pipes at all, provided you can introduce fresh air into the room.

481. Now, with regard to the important question of refrigeration, cooling the air, have you ever seen that practised ?—I do not know that I have.

482. Can you suggest any practical method of doing it ?—Yes.

483. What method, if you please ?—Well, I should suggest that you have a chamber containing a volume of air which shall be got together by means of fans, and then I should suggest that that air be passed

*Mr. W. Cox.*

21 March 1866.

through iced refrigerators, a room containing ice, which will lower the temperature of the air itself, and that it should then be passed up into the rooms. I believe there is no difficulty in doing this—at least I am informed so.

484. You are not yourself aware of any instance of its having been done, are you?—I am not aware.

485. Have you heard that it has been done?—Mr. Nelson, the architect, tells me it has been done.

486. Do you know whether Mr. Nelson himself has done it?—He didn't tell me he had, but he said it was possible. I asked that question for information.

487. It has been tried, I can tell you, and found excessively difficult—I have no doubt of it at all.

488. You have compared pictures to human beings, and you think they require as much fresh air and warmth as human beings do; but human beings vitiate the air by breathing, whereas pictures do not; why, then, should pictures require the same amount of ventilation as human beings?—On the principle that there is always a certain amount of fermentation going on in pictures, a certain number of years until they get soiled, and therefore if the air is impure—I know it from experience—or if you turn the picture face to the wall, it will turn yellow.

489. But then you turn it from the light, and that is another condition?—It may be partly air and partly light. If you put a picture in an impure atmosphere it will be sure to go.

490. Then old pictures would not require the same amount of ventilation as modern ones?—They would be better for it, but I do not think it is so essential.

491. Now, with regard to ventilation by gas, can you suggest any more efficient method of changing the air than by the heating power of gas?—I think that is a good plan, but I should exclude gas from the rooms altogether, and put it above a glass roof.

492. Suppose the burnt gas can be proved to escape wholly from the rooms, what then? Your objection would cease, I presume?—It would in some measure cease.

493. Would it not entirely cease if the escape of the burnt gas could be proved?—Yes, certainly, if it could be proved; but still I think, as you have in the Dublin Academy an instance of a second glass roof, which gives a better light than you get here, there is no reason why you should not try it.

494. You say you have been a colour maker, and the less vehicle is used the more likely the colours are to stand; but many colours are liable to change without vehicle, such as white lead and Naples yellow?—An artist knows what to use with those colours that change.

495. Take the case of white lead or Naples yellow?—White lead, if pure, would not change.

496. Not if exposed to the air?—No.

497. Not in a dry state?—Not in a dry state; it may.

498. It will go whiter?—Yes.

499. If exposed to air where animals or human beings are congregated, for example?—I do not know; I want pure air.

500. Where are you to get it?—In the South Kensington Museum if you ventilate it properly. Anywhere you can get pure air by scientific means.

501. Would not varnish tend to prevent those particles which produce change, take white lead, for instance?—I should say the varnish would rather tend to change it than otherwise.

502. Why?—Because it would turn it yellow. The action of the air would bleach it, would make white purer, if the vehicle you use is pure. *Mr. W. Cox.*  
21 March 1866.

503. Then, in that case, it would follow that a picture painted without any vehicle at all ought to be better preserved than one which is painted with vehicle incorporated with the colours?—I believe that is an acknowledged fact, and I think Millais gets some of his brilliancy from that very principle. If you paint a face white and glaze it over with varnish you will have pure colour.

504. It spreads sometimes?—Never, if you use copal varnish.

505. You mentioned that one of the pictures of Mulready, "Fair Time," exhibited many cracks, as though it were deteriorating, and you stated you thought it was owing to its peculiar position; have you formed any opinion as to the peculiarity of that position?—I did not say it was owing to the peculiar position. What I meant was that if that picture had had the necessary ventilation it would not have cracked at all. The cracking may have originated from having too thick a coat of varnish. I only say it is cracked.

506. You do not mean to say it was owing to its being in any peculiar position in this gallery?—Not at all. I do not mean that, because I should say all the positions are pretty nearly alike.

507. Now why, in your opinion, do pictures in private galleries exhibit less cracking than those in certain public galleries?—Because I think that where a large multitude of people is assembled it has a tendency to increase the heat of the rooms in which the pictures are hung, particularly in summer time, when perhaps you have the largest number of people.

508. Then you make the difference particularly to consist in the number of people viewing these galleries?—I make that as one feature, another is the mode of heating, and a third is the gas, which I contend ought never to be admitted into any gallery. I object to gas of any kind, however pure, where pictures are concerned, unless it is excluded by a glass roof from the building altogether. If I had a valuable collection of my own, I would not risk the pictures in a room where gas was burnt nightly.

509. What impurities that are present in the air of a gallery, for instance, in which a large number of people are assembled, do you consider to be most injurious to the pictures?—I should say anything that is impure at all is injurious to pictures; any impure atmosphere is injurious.

510. Carbonic acid, for instance, is that injurious?—If you have hydrogen, nitrogen, and carbon in equal proportions of course they will do no injury, but if you have too large an amount of either that would injure pictures the same as it would you. The more universal the ventilation the easier it is to prevent those evils from which many of these pictures are now unfortunately suffering. I do not mean to say there are not some of them which would not have cracked anywhere, especially where a large amount of vehicle, asphaltum in particular, has been used. If they had been carefully examined before having cracked, and the whole of the varnish removed, I do not think the cracking would have taken place in many cases, because, the material being softer than the surface of the picture, where you have a thin surface of varnish, the moment the expansion of this wetter material comes to bear it parts the varnish on the surface. Some artists I know use a large amount of asphaltum, and in those cases I have taken care to have the varnish removed as speedily as possible, and have the pictures lined, which has prevented

*Mr. W. Cox.* mischief arising. I have seen a great many of Opie's crack so that you could put your finger in the cracks.

21 March 1866. 511. Do you think glazing of pictures has a tendency to preserve them?—I disapprove of glass upon oil pictures at all, because you want atmosphere to play upon them, both for the purpose of bleaching and preserving. Pictures, for many years after they are painted, undergo fermentation, and all the medium comes to the surface, and that wants taking away continually. It must be taken away in the mode in which I tell you. Sometimes wiping will do it, it wants experience. Where gas is used in a close room pictures will turn yellow. That was the case with Herring's picture I have been speaking of.

512. You mentioned pictures being injured by high temperature—what is the maximum temperature to which you consider a picture may be exposed without injury?—I should say 60°.

513. Not beyond 60°?—I should not like it to go beyond 60°, especially where there are pictures of the experimental period. There was a period in art, at the time of Sir Joshua, when the artists of our school tried many experiments in various ways, by using wax and other things, and those pictures are more tenacious than pictures painted as solidly as Etty's; and what startles me most here is to see Etty's cracking so much.

514. Is this temperature of 60° never exceeded in private galleries?—It may be, but I do not think it is matter of so much importance in private galleries. In public galleries, where you have a large number of persons passing through, you require to be more particular about temperature than in private galleries.

515. Temperature with impure air is more injurious, you consider, than temperature with pure air?—Certainly.

516. What do you consider the lowest temperature to which a picture may be exposed without risk of injury?—You might expose it to 50° without fear of chilling or other matter that will make a picture almost unintelligible to the public. For instance, you cannot see a picture till the chill is rubbed away.

517. And that you consider to be the effect of low temperature, do you not?—Yes, I do. I think a picture kept in a temperature of 60° will not be liable to chill; but if you get below that you are liable to the picture chilling, particularly if recently varnished it is almost impossible to avoid it. All pictures recently varnished will in the first instance chill; there is no remedy for it, without you introduce oil into the varnish, and that is detrimental to the picture.

518. It is detrimental to the varnish?—It will change the varnish; therefore it is an evil I never allow of myself. The purer the varnish the more it chills,—that I believe is so.

519. Then you consider the exposure of a picture to the impure atmosphere of a town is injurious to it?—Impure air anywhere, whether in town or country, is injurious.

520. What will be the effect, for instance, of impure air upon the whites of a picture?—Well, I should say it would affect the whites probably quite as much as any colour, even if the white was used with the same vehicle. Of course different parts of pictures are affected differently according to the vehicle used in the painting of them. Different artists have different modes of painting. Some artists' pictures do not change so much as others.

521. But as a rule you think the less vehicle the better?—The more a picture is likely to stand in its purity of colour.

522. Have you ever known lead white stand with any sort of vehicle in the impure air of towns?—I have not noticed particularly. I have

21 March 1866.

always found that some makers make their whites purer than others ; that has a great deal to do with the purity of the white itself, to begin with ; if your white lead is pure, and you take care your oil is pure, your white will probably stand well.

523. You know that some years ago cards were glazed with white lead ; haven't you often noticed these become black by being simply carried in the pocket-book, or laid upon a table for some time ?—I have noticed they have changed colour, they have become black, or yellowish at all events.

524. They have no vehicle mixed with the white ?—I do not know ; I do not think you will find it will be denied by any artist that the vehicle does change.

525. The vehicle changes ?—But surely the white itself changes as well as the vehicle ?

526. (Mr. Redgrave.) Is it not the case that the worst changes in white occur when it is applied to water-colour drawing, and not oil ? that the old masters touched so often with the white that their pictures are spoiled ?—It may be so with regard to white ; I have not had much experience of that. I know there has always been a difficulty about white on account of the manufacture of it ; but I think the flake whites are found to stand better than the ordinary lead whites.

527. (Mr. Redgrave.) Would you purchase a picture in water colours painted with flake white ?—I should purchase a picture painted with anything if it was from an artist I could depend upon. I should not ask him how he painted it.

528. Even if painted in asphaltum ?—Well, I do not think we shall have many pictures painted in that now.

529. (Mr. Redgrave.) We do not use the lead white at all for such purpose now. But what I wanted to come at is that if you use a lead white without vehicle nothing on earth will save it ?—There is no doubt a difficulty, it always has been a difficulty.

(Dr. Percy.) An insuperable one.

530. I wanted to ask whether you attribute the injury sustained by the pictures here which are painted in asphaltum in any way to the use of gas ?—Not strictly to the use of gas. I should say that in some measure it has been increased by it, and it has also been increased by the heat of the place, owing to the large number of people who visit it, and by these circumstances combined.

531. At what time of the year do you suppose we get the greatest amount of heat in these galleries ?—I have not gone into that, but I should say when you have a large number of people, unless you have some mode of introducing cool air in the summer time, you must have a high temperature.

532. And then at night ?—At night I should say I have found it very warm here. I have been here at one or two conversaziones and I have found it very warm.

533. It might rise higher then, but these are very rare occasions ?—I do not attribute it to any one cause but to several combined.

534. Then you object to the heat of the gas ?—I should say to the heat of the rooms altogether, not particularly the gas. I am not stating that the gas alone is the cause, but I should say it tends.

535. Do you consider the pictures here are worse than those in the National Gallery, as respects this failure of the asphaltum ?—That I have not gone into. I have not noticed the pictures in the National Gallery. I think probably the elevation there is an advantage you have not got.

536. (Mr. Redgrave.) Is it much higher ?—It strikes me they are much higher than these.

Mr. W. Cox.

21 March 1866.

537. At any rate you attribute our failing here to a want of ventilation as compared with the National Gallery?—I think so; I do not say as compared with the National Gallery, because, to begin with, I tell you the old pictures will stand a greater amount of heat than modern ones.

538. But I think you said from your own feelings you thought that the National Gallery was well ventilated?—I think it is so from what I have seen of it.

539. But if you feel evil effects here and do not there, is not that convincing to you?—I have not gone very much into the National Gallery. I live at Brompton, and therefore come here oftener than I go to the National Gallery. The last time I was there, the impression I had was that the ventilation was very good; but I am not able to give a comparative opinion about the matter.

540. But Mr. Wornum thinks we ventilate here too much?—Then Mr. Wornum makes a mistake altogether. You can't have too much pure air in the rooms.

541. (Mr. Redgrave.) I suppose you are aware we have a great deal of pure air, Mr. Cox?—O yes.

542. You know how it comes in?—No, I do not. The man there showed me a ventilator, and if it is this you depend upon for fresh air you do not get it. There is no means by which you can get pure air into your building without exhaustion, or the fanning process; because, as it is, when the wind is in one direction it will come in, and when it is in another it won't, so that you do not get it for certainty. And permit me to ask whether you keep it at the same temperature at night as in the day?

543. Is the same temperature maintained by night and day in private galleries, in your own gallery, for instance?—No, you see my pictures are only temporarily there.

544. Is it in Mr. Baring's or the Duke of Wellington's gallery?—Very likely in the Duke of Wellington's gallery, or Mr. Baring's private house, they have the ordinary chimneys and fireplaces, and the temperature does not get down so low as in a large building like the South Kensington Museum.

545. Supposing we do not keep the fires up at night?—Supposing you do not keep the fires up at night, and admit in that amount of ventilation that I say is requisite for pictures, I can only tell you that my experience is this—in large rooms where I have gone in in the morning, when the place has been closed, I have found an impure atmosphere. I do not know whether you do it or not, but I say it is essential you should have the same universal heat by night as by day, as near 60° as it can be. That, in my opinion, is the best for pictures.

546. You simply wish to impress upon our minds that you desire uniformity of temperature?—That is all.

547. I wish to ask a question with reference to the "Blind Fiddler," whether that was painted in asphaltum?—I believe that more or less Wilkie used that vehicle; tradition tells us so.

548. You attribute the failure of Wilkie's pictures to that, which is true of some but not of others?—I attribute the sensitiveness of his pictures to that; but I say Wilkie's pictures will stand if you treat them properly.

549. (Mr. Redgrave.) There is no doubt of that, but there is a difficulty about some of the asphaltum pictures.

550. Are you prepared to say what is the cause of these cracks (photograph of Wilkie's "Duncan Gray" handed to witness)?—I should

21 March 1866.

say from the appearance of these cracks that that picture was painted in asphaltum.

551. And you would think, I presume, that if the painting in question had been in a private house, it could not have got into that state?—No, I do not say that; it might in a private house, because the air might be impure, there might be gas; and there might have been an undue amount of varnish put upon that picture, which would tend very much, with the softer vehicle underneath, to crack it. If the varnish had been kept away from it, and if it had been in a cool atmosphere, I do not think you would have found that picture in the state it is.

552. Supposing that picture to have been in a cool house, and ordinarily varnished, you do not think it would be in its present condition?—It might if it had been too thickly varnished; you can only come to results from effects.

553. What do you think of this (*handing another photograph*)?—That appears to me to be from the same cause, I should say; it seems to me to be attributable to the vehicle, whether asphaltum or not.

554. (*Mr. Redgrave.*) It is asphaltum; but what I want to know is whether that would be arrived at in a gallery lighted with gas, or whether it arises from varnish?—It may arise from combined causes.

555. (*The Chairman.*) I think we understand Mr. Cox quite well. He does not in the least degree contend that such things are not possible in private galleries; but he says that, by the devotion of a certain amount of care in these galleries, the pictures will live longer and be less injured than if not carefully treated?—That is what I mean.

556. You agree with Mr. Redgrave as to the difficulty of preserving asphaltum from cracking?—I quite agree with Mr. Redgrave.

557. But not as to the impossibility?—I do not know that Mr. Redgrave has stated it to be impossible.

558. (*Mr. Redgrave.*) I should tell you, Mr. Cox, that that was the state of those pictures when they came from Mr. Sheepshanks' private house under the best conditions. I have found asphaltum go just as much in Her Majesty's palace as at South Kensington, with every appliance to keep them. I have seen Etty paint, and his pictures do crack sometimes.

(*Witness.*) I have had some important works of his through my hands, and, as a rule, they do not crack. Mr. Joseph Gillott has a collection of Etty's, and they do not crack; he was a great patron of Etty. I was surprised to see Etty's cracking in this gallery.

559. Do you think he used asphaltum?—I have no doubt he may occasionally have used asphaltum, but not as a rule.

(*Mr. Redgrave.*) Neither did Mulready as a rule.

(*Witness.*) Mulready was probably the most solid painter England ever had. But I think, however pure a man may paint, if his picture is badly treated in varnishing and put into an undue heat, particularly if the heat gets at the back of the picture and not the front, then I say the picture will go, particularly if upon an absorbent ground. I think myself, if you have pure air, you want no glass at all in front of your pictures; I cannot see a picture that has got glass before it.

560. (*The Chairman.*) No doubt you have given the question the consideration of a practical man. You think it very desirable the public should have the opportunity of inspecting collections of this kind?—Certainly.

561. You think it practicable to make such arrangements at the South Kensington Museum that the pictures may be exhibited without exposure to danger?—Quite.

Mr. W. Cox.

21 March 1866.

562. You think a system may be introduced that will ensure the safety of the pictures?—Unquestionably, and you may make it a very admirable gallery. The gallery at the Exhibition of 1862 was an admirably lighted building, and answered the purpose very well. I think those two large towers, which gave you a large amount of atmosphere, facilitated very much the ventilation of that building. I do not mean to say the ventilation there was all I could desire, but certainly the light was all anybody could desire.

563. There was one case in which you said you thought gas was applied in a better way than it is here; I think you said the Dublin Academy?—The Dublin Academy has, in addition to the outside roof, a glass roof underneath that runs the whole breadth of the ceiling.

564. With the gas above it?—I am not quite clear about that at Dublin; but certainly it is at Baron Rothschild's, where the lanterns are outside the glass and between the two roofs. That is decidedly the most admirable thing I have seen. I went to see it yesterday, and the Baron was kind enough to show me the lanterns with the gas above the glass roof, and a most efficient plan it is. You can either raise or lower the lanterns, and I think they tend very much to ventilate the rooms. There is a heavy steam engine constantly pumping the air.

565. Does the Baron use a steam engine?—Yes, he has a steam engine at work; I saw it. I told the Baron that I thought he prevented ventilation by having fireplaces; that of course is an evil. The heat I noticed was 59° or 60°.

566. Pumping the air in with a fan would not affect the fireplaces; it would rather improve them than otherwise?—But the principle of ventilation I mean.

But Baron Rothschild I am told keeps the rooms perfectly closed; he will not have the windows open, and the difficulty was to get ventilation.

(*Witness.*) I went with Mr. Nelson to the Baron's to see this mode of ventilation, because I have always felt strongly upon that; and as I am building a new gallery now I want to adopt the best mode of ventilation I can, and if my gallery were to have pictures permanently in it I should adopt the plan I recommend in your case, of having an engineer in the place night and day and the same temperature kept up. I think by that plan you may ventilate any apartment, and by that plan alone. I believe it is the plan adopted at the House of Commons; how far it answers there I do not know.

South Kensington Museum, 21st April 1866.

PRESENT :

DR. PERCY IN THE CHAIR.

DR. FRANKLAND, F.R.S.

LIEUT.-COLONEL SCOTT, R.E.

CAPTAIN DONNELLY, R.E. (Secretary).

*Dr. David S. Price, F.C.S.*, having attended for the purpose of stating to the Committee the result of experiments as to the effects of light upon colours, &c., and having been requested by the Chairman to make his communication, said :—My experiments refer principally to the destruction of pictures from foul air—sulphuretted hydrogen. My attention was first directed to the subject by observing that in the cases in the technological museum under my direction at the Crystal Palace, which are painted white on the inside surfaces with white lead, in which were arranged substances that contained sulphur as an element of their constitution, discolouration of the paint took place only where the light was intercepted, as, for instance, by the cards on which were written the descriptions of the specimens, and beneath these the paint was invariably blackened; where the light had free access the surfaces of the cases retained their whiteness. This was noticed in the cases containing the sulphur series, wools, hairs and bristles, and vulcanized india rubber. Having observed this fact, I then made some direct experiments, and for this purpose had a piece of deal (*exhibiting a slab of wood*) painted white with white lead mixed with linseed oil. When quite dry I placed the board in a box, and submitted it to an atmosphere of sulphide of hydrogen gas (the gas commonly occurring in foul air) until it had assumed a uniform dark chocolate colour. With this board thus coated with a film of sulphide of lead, I was enabled through the kindness of my friend Mr. Robert Hunt, of the Mining Record Office, to test the chemical action of various coloured rays upon it. The glasses which I selected were of the following colours, red blue, violet, and the one of the tint recommended by Mr. Hunt for glazing the large conservatory at Kew.

These glasses were placed on the surface of the board. At the part of the surface marked A the light was shut off by means of an opaque cover, whilst at B the surface was left exposed. The board thus arranged was placed in a strong light for eight days. The following are the results :—At B the sulphide was entirely oxidised, the surface having resumed its original whiteness. At A the sulphide is unchanged. Under the red glass there is the same result. The space covered by the blue glass is not quite bleached, and similar effects are observable on those covered by the violet and the Kew glasses. I tested also the effect of the light passing through the so-called “rolled cathedral glass,” and found that this glass obstructed the chemical rays to a somewhat greater extent than did the Kew glass.

I then took an oil painting and subjected it to the action of sulphide of hydrogen gas until the surface had become so dark in colour that the picture was scarcely discernible. Broad strips of opaque paper were then fastened across the surface at certain distances apart. The picture was now exposed to the direct action of the light for some months. The results are before you. Where the light has penetrated the picture is restored, where it has been cut off by the bands of paper it remains

*Dr. David Price.*  
21 April 1866.

*Dr.**David Price.*

21 April 1866.

black. One important bearing of this experiment is, that it shows you that if you put your pictures in a bad atmosphere the lights become darks, but that by exposure to the light they may be restored to their original beauty. If you have only good light in a picture gallery it matters little what may be the state of the atmosphere, presuming, of course, that it is not constructed immediately over or near to the opening of a sewer.

569. Is it the same whether a picture is varnished or not?

(*Dr. Price.*) My experiments have not been extended to varnished pictures, but the action would I think in this case be very slow. I may mention that if I put a drop of linseed oil on to a surface converted into sulphide of lead as before described, and expose it to the light for a day, that it will become oxidised and whitened, showing that the oil acts as a carrier of oxygen. This action is still more rapid when boiled linseed oil is used.

570. (*Mr. Redgrave.*) Supposing zinc white were used instead of white lead?

(*Dr. Price.*) You would then have sulphide of zinc formed which is white, and therefore no visible effect would be produced.

571. (*Mr. Redgrave.*) This (*painting*) would change in what time?

(*Dr. Price.*) The time required to effect a change in a picture must depend doubtless upon its age; the action of light would be more rapid on one freshly painted than on one that has been painted for a very long period, as in the latter case the oil by the action of the oxygen of the air has become converted into a resin or varnish. Mr. Cooke, R.A., instances, in evidence given before the "Royal Commission appointed in 1857 to report upon the site best adapted for the National Gallery," the case of a picture of his own, which he had lent for exhibition to a gallery where it was exposed to a strong light, that when after five months' absence it was returned to him, he was surprised at its extremely bright appearance. I will now, with the permission of the Committee, mention a practical application which arises out of the above observations. It is the use of what I propose to call a *sulphurometer*, an instrument for testing the state of the atmosphere of picture galleries. It should be constructed thus:—A piece of canvas should be painted with white lead and then cut into several slips. One slip should be enclosed in a glass tube and kept exposed to the light. This would be the standard for comparison. The other slips should be enclosed in tubes in such a way that the air of the galleries could come in contact with them. If now at any time it were desired to ascertain how the air had during a certain interval affected the test pieces, it would be necessary only to compare them with the standard slip. In the early part of my examination I stated that the cases in my museum which contained wool were blackened where the light was not admitted, and this fact has a direct bearing upon the National Gallery, more particularly during the Easter and Whitsun holidays, when thousands of people clad in woolen garments visit the collections, and when it may safely be presumed the atmosphere is not of the purest kind.

I have given you the results of my observations on oil colours. I will now mention a still more curious fact in reference to water colours. Being desirous of learning whether sulphide of lead would be oxidised in the absence of oil, I painted a piece of cardboard with carbonate of lead mixed with water. This painted surface I converted into sulphide by the action of sulphide of hydrogen gas, as already described in the case of the oil painting. Parts of the surface were then covered with opaque cards, and the remaining portions left uncovered. The surface of this board was then exposed to the action of light for a very

long period. The sulphide of lead has, as you see (*showing the illustration*), become completely bleached where the light has had free access, but remains unchanged and dark where the light has been excluded.

572. Mr. Redgrave remarked that it had long been the opinion, that the exposing of oil paintings to the light was advantageous. If pictures were turned to the wall they darkened, but bleached again when brought into the light.

(Dr. Price.) It depends very much upon the nature of the colours used. There are two causes why a picture becomes discoloured. First, the varnish darkens to a yellow colour. A short exposure to light suffices to restore a surface thus discoloured to its original state. This I find to be the case in all the cases of my museum at the Crystal Palace; and, second, as already stated, the condition of the atmosphere comes into play upon the colours mixed with white lead, or containing lead oxide as an ingredient. There is another matter upon which probably I may be allowed to speak, and that is, on the subject of placing glass over paintings. I am very fond of pictures, &c., and I endeavour as much as possible to exclude the foggy atmosphere of London from my chambers in Westminster. A downward current by the chimney I check with a damper whenever there is no fire in the grate. Notwithstanding this precaution, I find that if I take a white handkerchief and pass it over the surface of the glass of a picture, I can at any time detect and remove a sooty film. In my chambers there is a case of minerals covered with a large square of plate glass. This glass had not been cleaned for some time, and the other day, observing that it was uniformly clouded over, I sought to cleanse it. This I found was no easy task, and upon examining into the cause, I discovered that the coating did not only consist of a leaden coloured film of diluted soot, but that it was likewise unctuous. Upon thinking as to what could be the cause of this, it struck me that the countless fire-places in the metropolis are only so many open-mouthed retorts for the slow distillation of coal, and that we not only have soot, but paraffin, naphtha, and the other products of the distillation of coal, as constituents of our London atmosphere, as well as the products obtained by the calcination or more perfect combustion of the coals, amongst which may be reckoned the sulphur acids derived from the pyrites, which act so destructively upon our public buildings constructed of limestones and dolomites. I have not the least doubt that the above is the explanation of the greasy condition of the glass alluded to, and that from an art point of view it would be well, in the winter portion of the year especially, to regard our atmosphere as little better than the vast alembic of the countless coal distillatory apparatus of the metropolis, a definition which its colour on most days fairly justifies.

The above is a view that has not yet been taken of our London climate, and I thought that it would be well to direct attention to it, as it bears directly upon the question of protecting pictures with glass. I should not think of keeping a valuable oil painting in London without protecting it with a glass.

573. (Dr. Price.) There is one other subject I should like to allude to, and that is, on the use of colours by artists. I have the pleasure of knowing many artists, and have frequently discussed the subject with them. It has surprised me to find how little they know of the chemical nature of the pigments they employ. It was only a few days since that I was talking to an artist, and he told me that they were now selling a white lead out of which the blacking principle had been extracted. Upon my explaining to him the impossibility of this, and expressing to him my regret that artists did not know more of the composition and

Dr.  
David Price.  
21 April 1866.

*Dr. David Price.* properties of the colours they used, he replied that the colourmen tried to mystify them as much as possible. There was one thing I told him that must be done sooner or later, and that was for the Royal Academy to appoint some intelligent chemist to examine into and conduct experiments upon all the materials which artists employ. It is a duty which the country owes to art. There is one other topic which I mentioned just now, the action of light upon vegetable substances, upon which you may perhaps wish me to make a few observations. I have had frequent opportunities of studying this action in the Crystal Palace. I find that there, a dye considered the most permanent, and by most persons regarded as permanent—Turkey red, a madder colour of great brilliancy—becomes bleached on the exposed surface of the cotton cloth in about three years; the under surface being comparatively but slightly changed in colour. Fabrics dyed with mauve, the aniline dye discovered by Mr. Perkins, possess great stability, but fade in our strong light at Sydenham after very lengthened exposure. Some fugitive colours like the salts of roseine, or as they are very generally called magenta, although speedily changed by exposure to light, remain permanent for an unlimited period if excluded from it. The samples which I now show you were the first ever dyed with the salts named. They have been kept in a drawer, and are as bright now as on the day when they were first prepared by Mr. Nicholson and myself. Many organic colours are very fugitive when exposed to the light, as is well known to be the case with those derived from the lichens, the archil colours; so also are the vegetable yellows.

574. Take Vandyke brown—what is the effect of that?

(*Dr. Price.*) I have never tried.

575. How are you to tell in the case of pictures already painted what will be the effect?

(*Dr. Price.*) There is the difficulty; you can only guess at it.

576. There is a lake used by the Venetians, which is as bright now as it was the day it was put on. That must be a vegetable lake; there are no other lakes are there?

(*The Chairman.*) It may be some oxide of iron; they are very brilliant sometimes.

577. Then comes in another question, how far the vegetable colours are preserved by the materials used with them.

(*Dr. Price.*) I believe it is only a question of time, and that every vegetable colour will vanish.

578. (*Mr. Redgrave.*) The greens in many of the Dutch pictures are gone, but in the Venetian both the greens and lakes are as brilliant as the day they were painted, and that must be 300 years ago.

(*Dr. Price.*) There is emerald green; that does not change at all.

(*Mr. Redgrave.*) That is not a colour of the nature I speak of. Emerald green is a solid colour. I speak of the transparent greens, which I suppose are vegetable greens.

579. (*The Chairman.*) Take terra verte; you would call that transparent, would you not? That is a mineral. And there are the madder colours; they are all of a permanent character, I believe?

(*Dr. Price.*) Yes, permanent in the ordinary acceptation of the term.

580. (*The Chairman.*) When printed upon calico they never change by exposure to light.

(*Dr. Price.*) The Turkey red which I mentioned is a madder colour, and that goes, but then the circumstances at Sydenham are very trying.

581. (*The Chairman.*) Will it go experimentally, when mixed with various vehicles, varnishes, &c.?

(*Dr. Price.*) I have never tried it.

21 April 1866.

(*Mr. Redgrave.*) That is an important point. We mix lead with our colours, and it is very important to know whether lead mixed with lake, for instance, will stand or not. We use it in our flesh tints ; and my impression is, it will not stand. But the madders, which I presume are new colours, we are quite in the dark about, as to whether they are permanent. In Sir Joshua's pictures the greys and browns remain, and all the lakes are gone.

(*Dr. Price.*) That reminds me of how an artist was deceived by what was represented as a madder yellow. He asked Professor Taylor, I believe, to analyse it for him, and he found that there was no madder in it at all.

(*The Chairman.*) Madder colours became popular, and therefore, I suppose, the name was applied to colours that really were not madder.

582. (*Mr. Redgrave.*) There is a madder yellow and a yellow madder ; one is something like brown pink, and the other is more like Indian yellow.

(*Dr. Price.*) The last-named yellow is called purree.

583. (*The Chairman.*) It comes from the colouring matter of a plant.

(*Dr. Price.*) It is supposed to be an animal secretion, and comes to us from the East. It has been chemically investigated by Erdmann and Stenhouse. I have a large ball of it.

584. Have you made any investigation into the special cause of this change ? (*referring to specimen.*)

585. (*Dr. Price.*) You mean whether the sulphide is converted into sulphate or not ?

Yes.

(*Dr. Price.*) No, I have not. I have taken absolutely pure carbonate of lead with linseed oil, and painted two or three sheets of glass ; I am going to convert it into sulphate, and then expose it ; I shall then scrape that off, test it, and see whether it is sulphate, or what it is.

586. You have not tried the effect of exposure in a vacuum ?—No, I have not.

587. Or in an atmosphere of carbonic acid ?—No, I have not.

588. (*Mr. Redgrave.*) I do not know whether I may make the observation ; but, as an artist, I feel I should like to see some lead mixed up with varnish, boiled oil, linseed oil, and turpentine, and put on in streaks ; so that you could expose one half and blacken the other, to see how it acted upon the lead mixed with the different vehicles.

(*Dr. Price.*) That is very important. I have tried the effect of an immense number of oils on the sulphide of lead, and the surface has been converted into sulphate, but with the exception of boiled oils the action is not rapid.

589. (*Mr. Redgrave.*) I do not think that is of importance to artists ; but it would be of great value to know that if we painted with varnish it would be better than if we painted with plain oil or a mixture.

(*Dr. Price.*) That could easily be done.

(*Mr. Redgrave.*) I must say it is very much to be desired that experiments should be carried on in reference to colours, but I do not know whether it should not rather be done by some public institution than by private individuals. Experiments could be carried on here, where we have every facility, or at the Academy. Dr. Price says at the Academy.

(*The Chairman.*) They would hardly do anything there yet. Have you considered at all whether temperature has any effect in producing this change ?—No, I have not.

Dr.  
David Price.

21 April 1866.

*Dr.**David Price.*

590. With the same amount of light you do not know whether the temperature will alter it?—No, I do not. The temperature ought, properly, to be registered, but I do not register it.

21 April 1866. 591. (*Mr. Redgrave.*) You have a higher register at Sydenham than we have.

(*Dr. Price.*) But these pictures were placed in a room where light is admitted only through one window.

592. Do you know the temperature of the picture galleries at the Crystal Palace?—It is a variable temperature.

593. In the summer are you able to keep the temperature lower in the inside than it is outside?—The top being all glass it is necessary to have some felt on the inside about so far (*explaining*), so as to have a layer of air between, and that keeps the gallery perfectly cool. The glass at the top has been distempered with white, and an awning is placed beneath it in summer also so as to keep the air between.

594. (*The Chairman.*) Can you keep down the temperature much below that of the circumambient air?—Oh yes, considerably. I will give you an instance of how the temperature rises in a building of this kind. During the first hot day in the present week we had not got our awnings out, and when I went into my gallery I was horrified at finding the temperature at 96°, and was almost afraid some of the wax models would be melted. I immediately obtained a special order for awnings, and merely putting them up produced a wonderful difference, bringing the temperature down about 15°.

595. Would the temperature in the shade out of doors be higher or lower in the gallery?—That I cannot say. The gallery never strikes you as being hotter than the main building.

596. I do not suppose any felting you could give to the walls of the Crystal Palace would have more effect in reducing the temperature than a brick wall, if it was cold?—Certainly not.

597. Then, *cæteris paribus*, our walls are brick, and yours glass, and you do not think one is better than the other for keeping out the hot air?—Bricks are the best non-conductors there are. You may have a brick white hot at one end and cool at the other.

598. Do you suppose that covering a picture with glass can have any injurious effect upon it?—There has been evidence given upon that point before a parliamentary committee, and I should be sorry to give my opinion against those who have probably had a better opportunity of knowing than I have.

599. Have you formed an opinion upon it?—Yes. I should not hesitate myself to put glass before a picture. It must not be forgotten, however, that if an old painting that may be impervious to water were to be covered with a glass, whenever the temperature rose you would get vapour or moisture in the intervening space between the glass and the surface of the picture, and there is nothing that will induce fungi to grow so much as dampness or moisture. If you want to induce dry-rot the best thing you can do is to cover a board, and then expose it to a damp atmosphere. If you were to ventilate the frame by having a passage of air, so that the vapour could escape, I do not think a picture could possibly hurt by having a glass over it.

600. Do you not think the ventilation you propose between the picture and the glass would do away with a great many of the advantages derived from the glass, inasmuch as you would admit dust, and so on?—It would undoubtedly. It is almost impossible to keep dust out of a case; it will enter in all directions. The only way to prevent it would be always to have a current of air passing through the case, and

that might do it. I think that idea was suggested many years ago for the museum in Jermyn Street.

Dr.  
David Price.

(*The Chairman.*) Mr. Mallet recommended it, I think.

(*Dr. Price.*) I think that would be the only perfect way of having the pictures ventilated. You must get rid of the moisture.

21 April 1866.

601. Is there any objection besides that of moisture that you have to a picture being hermetically sealed?—No, there is none other occurs to me.

602. So that if you had a contrivance for absorbing the moisture that would get rid of your objection?—Yes.

603. There is nothing in the glazing of pictures which would prevent this bleaching action going on, is there?—No, I do not think so. In putting a glass over a picture I should recommend that it be put on with hinges, so that you can open it, and I will give you one reason for that—I find the best glass in many instances, sometimes the most expensive plate glass, subject to a decay; it weathers or decomposes.

(*The Chairman.*) What they call kyan?

(*Dr. Price.*) It gets covered with crystals. The best plate glass I have in my museum has to be perpetually cleaned; it is always decomposing; and therefore on that account, if you were to fix plate glass absolutely, you might in course of time find it a very bad expedient.

(*The Chairman.*) That only applies to certain varieties of glass. Some of those in Jermyn Street have that peculiarity. I spoke about it to Mr. Russell years ago, and he told me it was by no means infrequent in a certain class of glass, still it is not general. It is more likely to occur in plate glass than in crown glass blown and then polished.

(*Mr. Redgrave.*) All our glasses here are put in from the front, so that you can remove them; in fact, it is necessary that you should wipe them occasionally.

604. We have had a great deal of advice about the advisability or otherwise of having a dry atmosphere, do you think the pictures are likely to suffer from a dry atmosphere?—To tell you the truth I have not given very much attention to the details of the subject. It was from a chemical point of view that I first took it up, but afterwards I viewed it in an artistic one. I do not see how a dry atmosphere would hurt a picture.

605. At any rate it would not encourage the growth of fungi?—No, certainly not.

606. Do you see how a moist atmosphere can be beneficial to a picture?—No, I cannot.

607. On resinous matter you have not given us your opinion; it may be important.

(*Dr. Price.*) Most vegetable fibres contain a resinous substance. In some this darkens by lengthened exposure to light. Thus I find that in the cases of the museum the fibre of pine apple (*Ananassa sativa*), and fabrics made with it, which were originally nearly white, assume a dull red colour. The same takes place with Cuba bast (*Hibiscus elatus*), Manilla hemp (*Musa textilis*), and other fibres which I need not specify. Pine wood acquires a pale red colour, but when excluded from light it retains its white appearance. I have curious illustrations of this. The titles of the contents of the cases in the museum are printed in black ink on white paper. These headings are framed and glazed, the back board being of pine. When after long use the glass and paper are removed, the words of the title are invariably visible on the wood; that is to say, the spaces covered by the black letters remain white, whilst the remainder of the wood covered by the translucent paper is of a reddish hue. Cotton

Dr.

David Price.

21 April 1866.

fibre does not change colour. Bleached shellac in course of time turns to a brownish colour.

608. (*Mr. Redgrave.*) That is rather contradictory. The red darkens.

(*Dr. Price.*) That only shows how important it is to find out the difference between the resins.

609. (*The Chairman.*) I daresay you have observed it before. It has struck me as very remarkable. I had a capital illustration of it a few months ago, in the case of an open painted door. It had not been painted since 1851, it was an interior door exposed only to a very diffuse light. You know the custom of painting all the knots over with red lead; every single knot was as visible as possible after that time, all the rest of the door being much darker; you might almost see the traces of the brush. These things stood out in bold relief as it were through the darkened surface of the door. That might have some influence upon grounds. Did not the Venetian painters use red grounds, prepared with red lead?

(*Dr. Price.*) Don't you think red lead would act as an oxidiser?

(*The Chairman.*) Yes.

(*Mr. Redgrave.*) Some of the Bolognese school painted on red grounds; and the Dutch used a ground something like tanned leather.

610. (*The Chairman.*) I think you suppose mineral colours will stand. Take the common realger; that exposed to light will become converted into yellow powder.

(*The Chairman.*) Realger is best; you can see it change. You know that in the case of pink glass in windows the portion protected by the putty retains its original brightness, whereas the other is changed.

(*Dr. Price.*) There is one observation I should like to make with regard to gutta percha. I find that sheets of gutta percha at present manufactured are spoiled after they have been exposed for some time. They may be reduced to dust by mere pressure.

611. (*The Chairman.*) There are three resinous bodies that concern the artist—copal, mastic, and amber?

(*Dr. Price.*) I have not made any observations about them.

612. (*Mr. Redgrave.*) That is a curious fact about gutta percha. There has been a proposal to make gutta percha grounds; you think they would be very unsafe?

(*Dr. Price.*) Oh, certainly. When gutta percha was first introduced into England I was very much struck with it, and I bought a specimen in the form of a tray. It has been kept in a sombre light ever since, and is not at all brittle. That was before the adulteration of gutta percha took place.

(*Professor Frankland.*) A wonderful change has taken place in gutta percha. Twelve years ago I had a gutta percha pipe put up, and it has now hardly become brittle; but one I had only two years ago is now very brittle.

(*The Chairman.*) The Society of Arts had a commission to inquire into that, and Dr. Hofmann said the conditions most destructive to gutta percha were conjoint moisture and air.

(*Professor Frankland.*) It never came near moisture, but it crumbled to pieces in two years.

(*The Chairman.*) If it was a speaking tube, there must have been a good deal of moisture in it.

(*Professor Frankland.*) I do not think there was sufficient. It was not much used.

## National Gallery, Trafalgar Square, 28th April 1866.

## PRESENT :

PROFESSOR TYNDALL, F.R.S. IN THE CHAIR.

Dr. PERCY, F.R.S.

Dr. FRANKLAND, F.R.S.

LIEUT.-COLONEL SCOTT, R.E.

CAPTAIN DONNELLY, R.E., (Secretary.)

The Commission proceeded to examine the picture galleries, accompanied by Mr. W. Boxall, R.A., the director, and by Mr. R. N. Wornum, the keeper and secretary, of the National Gallery.

The thermometric readings in different parts of the building between the hours of half-past 2 and 3 o'clock in the afternoon, the sky being quite overcast, were as follows :

New Room (33 feet $\times$ 31 feet) water in boiler -	68°
Turner Room { doorway - - - -	68.5°
opposite end of room - - - -	67.4°
Claude Room { west door - - - -	68°
side of room - - - -	67°
Flemish Room - - - - side	66°
First square room - - - -	66°
Second    ", - - - -	66.7° and 65°
Italian Room - - - -	66° ; sides 64° and 64.5°
Vestibule - - - -	65.5°
Downstairs at 3 o'clock before open front-door	64°

## South Kensington Museum, 2nd February 1870.

## PRESENT :

PROFESSOR TYNDALL, F.R.S., IN THE CHAIR.

DR. FRANKLAND, F.R.S.

COLONEL SCOTT, R.E.

CAPTAIN DONNELLY.

W. BOXALL, Esq., R.A., examined.

613. (*The Chairman.*) In 1865, Mr. Boxall, a commission was appointed, consisting of Professor Graham, Professor Tyndall, Dr. Frankland, Lieut.-Col. Scott, R.E., and Captain Donnelly, R.E., to report upon the system of heating and ventilating the South Kensington Museum, and especially to consider if any injurious effects have arisen to works of art from heating by hot water; also to consider the report of Mr. Faraday and others of the 20th of July 1859, (see Appendix, p. 88.), and to report what further precautions, if any, are necessary to be adopted. This Commission was appointed, and one of the original promoters of it, Sir Matthew Ridley, I find by a letter addressed by Mr. Redgrave to Captain Donnelly, suggested that the subject of the condition and treatment of the pictures in the museum might with advantage be submitted

W. Boxall,  
Esq., R.A.

2 Feb. 1870.

W. Boxall,  
Esq., R.A.

2 Feb. 1870.

to the opinions of professional and practical persons. On that account, Mr. Boxall, you are now called upon by the Commissioners and requested to give us what information you can upon this subject. May I, in the first place, ask you, Mr. Boxall, whether you are acquainted with the present state of warming and ventilating of the South Kensington picture galleries?—Yes.

614. It has been stated that hot-water pipes are objectionable, and that open fireplaces are better for the purposes of warming and ventilation. Is that an opinion in which you coincide?—It is not; I think open fireplaces are objectionable because of their unequal distribution of the heat. Pictures near the fire are liable to injury; those opposite and subject to the reflection of the fire are imperfectly seen. Another objection is the accumulation of dirt and soot they create.

615. And I think you also considered that a more equable temperature, a less variable temperature, is obtainable by means of hot water than by open fires?—I have no doubt of it.

616. You think variation of temperature decidedly prejudicial to pictures?—Violent and sudden variations of temperature I am convinced are prejudicial to pictures.

617. Would it be fair to ask you, Mr. Boxall, what you consider violent variation?—Allow me to give an example. One winter evening I was present at the lighting of the gas in one of the galleries here. The room was very warm, and when the glass of the skylight was opened to allow the carriage to run along to light the jets of gas, there was a sudden and violent rush of cold air admitted, the constant recurrence of which could not fail to be prejudicial to the pictures, and the more especially as the heated water pipes were in close proximity to the pictures. This has I know been remedied in the new gallery.

618. You objected to the heating of the air immediately under the pictures?—Yes.

619. That, you say, has been changed, so that the objection no longer exists; but the objection as you consider still remains with regard to the sudden admission of chill from the opening of the windows when the gas is lighted?—If the system still continue my objection would remain the same.

620. Can you tell us exactly in which gallery it was you experienced the effects you state, and at what time of the year it was?—It was, I believe, after this commission was formed, and in the winter, in one of the rooms occupied by the National Gallery pictures.

621. (*Captain Donnelly.*) Was it the gallery in which the cartoons were?—Certainly not.

622. One of the galleries that has not got double skylights?—I presume it might be, but I cannot remember.

623. (*Dr. Frankland.*) One of the later galleries?—Yes.

624. (*Captain Donnelly.*) Some of the galleries have a double roof, and there is a glass ceiling underneath the skylight. Some of the temporary galleries had not the glass ceiling underneath the skylight. Do you remember which gallery it was, Mr. Boxall?—I do not. I remember the effect I experienced perfectly. A glass ceiling underneath the gas would have prevented the evil; but I do not remember that you have glass ceilings underneath the gas.

625. (*Captain Donnelly.*) Over the gas. I thought that might call to your recollection which gallery it was?—I remember only the conviction I felt of its very dangerous tendency.

626. (*The Chairman.*) Then with regard to the cold air, you think it came not through doors, but through the windows above?—At the opening of the windows it was suddenly perceptible.

627. Were the doors closed at that time?—I cannot say. You see the sudden effect I felt might be my reason for thinking it would affect the pictures. That was before this Commission was appointed. I only felt the thing rather than investigated it.

W. Boxall,  
Esq., R.A.

2 Feb. 1870.

628. Then it would be prior to 1865?—Yes.

629. Have you examined the galleries recently?—I have not done so very lately.

630. (*Mr. Redgrave.*) Have you paid attention to the Sheepshanks Gallery?—In the Sheepshanks Gallery, which is in every respect most satisfactory, the objectionable pipes beneath the pictures no longer exist, and the heat comes more from the centre of the room. In two of the rooms at the National Gallery, which formed part of the Royal Academy, the pictures are still heated by hot water pipes beneath them, but thick slabs of slate instead of boards are introduced between the pipes and the pictures, and the temperature in these rooms is seldom above 57°.

631. (*The Chairman.*) In summer?—In the summer the pipes are not heated, and therefore can have no influence.

632. Have you any knowledge as to the summer temperature?—Mr. Wornum, in his evidence, has given it from the thermometer.

633. It might be 70° or 80° in summer?—I refer you to his evidence, as it has been his duty to watch, and he has there given the results of the readings of the thermometers.

634. You think if means have been taken to avoid that sudden depression of temperature which you speak of upon the lighting of the gas, the galleries, as far as warming and ventilating is concerned, are all that can be desired?—Unquestionably much would be gained.

635. You are acquainted of course with painting on asphaltum?—Yes.

636. And you are quite ready to believe that sudden changes of temperature are likely to produce cracks in pictures on asphaltum?—Asphaltum never dries, and such pictures are necessarily subject to atmospheric changes.

637. Then you agree with Mr. Redgrave that it is exceedingly difficult, if not practically impossible, to prevent the asphaltum cracking?—Entirely impossible, if the picture is ever varnished.

(*Mr. Redgrave, exhibiting a small picture.*) I would call attention to this picture in order to remark that it was bequeathed to the Kensington Museum by Mr. Henry Townsend. It has been in the gallery about a year and a half, and is now in the same state as near as possible as when it first came here. It is a Belgian picture and shows the effects of painting on an asphaltum layer. The thicker colour has cracked all the way down; and it shows that this is not the effect of English climate merely, for this is a Belgian picture and was in the state you now see when it was received here.

(*Mr. Boxall.*) In any climate that picture would crack. A thick ground of asphaltum painted over with hard drying colour mixed with white, must inevitably crack.

(*Mr. Redgrave.*) Is not this analogous to the "Sabrina" of Hilton? He used an unusual quantity of wax, and bought it without ascertaining whether it was pure. It was probably adulterated to a large extent with spermaceti, which made his pictures more liable to run than any other pictures. I have another picture here (*pointing*) which has come into the Museum since this Commission began. It was presented by Sir William Tite. It has all the effects of asphaltum in one way, but there is not the cracking all down.

638. (*The Chairman.*) Would you be kind enough, Mr. Redgrave, to put upon paper, in a brief form, the remarks you have to make with

W. Boxall,  
Esq., R.A.

2 Feb. 1870.

regard to this picture, describing its condition in brief terms, and what has been the effect of this layer of asphaltum with painting over it?

(*Mr. Boxall.*) The cracking of the asphaltum is, I believe, quite independent of temperature.

(*Mr. Redgrave.*) I beg to say I have selected these two pictures especially because they have not been in our gallery sufficient time for any change in their condition to have been effected from any circumstances connected with the gallery itself. The pictures are in precisely the same condition as when they came from the private residences of the donors.

639. (*The Chairman.*) Have you given attention to the subject of the preservation of the Raffaello cartoons?—With regard to tempera paintings generally, I believe that they ought not to be placed in too dry or too heated an air, because it is apt to destroy the tenacious properties of the size. Mr. Redgrave has, perhaps, given greater attention to this subject, but I believe he will agree with this opinion.

(*Mr. Redgrave.*) Too dry an air is not good.

640. (*The Chairman.*) Are you acquainted with the position of the cartoons here?—Yes, the gallery is most satisfactory.

641. Have you reason to suppose that the air there is prejudicially dry?—It may be so if it should be overheated by gas.

642. I think we shall come to understand each other. When you speak of what you consider the prejudicial effects of gas upon pictures, I apprehend it is apart from the consideration that the products of the combustion of gas are all carried off into the air outside the building. In the report of Mr. Faraday and Dr. Hoffman it is stated that the products of the gas are all carried off?—I do not enter into the scientific question, and I should be glad to yield my opinion to you gentlemen who have given attention to the subject, but from my own experience I have no favour for gas in picture galleries. I had it for many years in my painting room, and I always felt that it affected colours exceedingly.

643. But probably you had no means provided for the immediate escape of the products of combustion?—It was used with ordinary burners.

644. I should like that we should agree, if possible. It is not so much gas as gas, but because it gives out heat; because in the case of the galleries here the products pass off into the air outside, so that the drying effects of the gas would not be more than those of a fire?—May there not be a certain mischievous drying quality in gas, for example, the heat of the gas darkens, while that of the sun purifies colours; too much of either are alike destructive.

645. The question whether the heat of the gas is too great may be determined by taking a series of observations?—I presume so; but can the quality to which I have just now, probably unscientifically, referred, be easily determined?

646. (*Dr. Frankland.*) Looking at the conditions under which the paintings are exhibited here, do you consider there are any special disadvantages as compared with other public galleries with which you are acquainted?—I perhaps ought not to say that gas is a disadvantage, but I know of no public gallery out of England where gas is used. There is so much to admire at South Kensington that I may be permitted to say that I still look upon the introduction of gas there into picture galleries as an experiment.

647. Do you consider in this country paintings last a shorter time than they would do in Italy?—Many of them last a shorter time, arising

from the want of system of the painters ; the pictures too often begin with bad constitutions.

648-9. Do you consider suspended matters in the air affect the pictures prejudicially ?—Most likely.

650. Do you think the covering of pictures with curtains tends to their preservation ?—Keeping the actual sunshine from pictures preserves them ; but I do not think darkness is good.

651. (*Mr. Redgrave.*) Is it not the fact that pictures on the continent are very much covered for the purpose of their being displayed only occasionally ?—In the churches no doubt that is the case, but protection from sunshine is good.

652. (*The Chairman.*) Supposing the products of the combustion of gas are all carried clear away from the room, could there be anything in the heat or light prejudicial to the pictures ?—I should be most glad to be convinced that there is not.

653. We have had various opinions expressed as to the effect of light upon paintings. Does your own experience suggest to you that if an oil painting is kept in darkness it darkens ?—It is the general belief that it does so.

654. And becomes brighter in the light ?—And becomes brighter in the light. Too much light will sometimes fade colour ; but that the old painters exposed their pictures in their progress under certain circumstances to sunshine there can be no doubt. It was the custom of Titian to do so, as we learn from "Boschini." It is related that he placed his portrait of Paul III. on the leads in the Vatican to dry after he had varnished it, and that people passing made reverence to it, thinking it was the Pope.

655. (*Mr. Redgrave.*) It was the same with Van Eyck as a drying process only. We can hardly suppose that Titian wanted to take the yellow out of his pictures.

656. (*The Chairman.*) Do you think the change which takes place in pictures is through the change of the pigments or the change of the oil ?—The oil generally becomes browner, and many of the pigments change. The absence of light darkens oil. Yet I have a picture painted 10 years ago, with simple linseed oil, which has been turned to the wall ever since, and it has not changed in the slightest degree. This is, however, an exception to the general rule.

657. (*The Chairman.*) Perhaps Dr. Frankland will tell us whether in the process of bleaching there is anything analogous to this. We know that substances wetted and exposed to sunshine will bleach, but this is the reverse process of darkening by withdrawal from sunshine.

(*Dr. Frankland.*) I am not aware of any such action having been clearly seen in the case of oils or varnishes, but if the action went deeper and took place upon the pigments themselves, then there is always a tendency of the lead in the pigments to become converted into black sulphide of lead, but it becomes bleached on exposure to light. If a picture is exposed to light the darkening of the pigments does not take place as if it was kept in the dark.

658. (*Captain Donnelly.*) Are you aware of any careful set of experiments having been made as to the effects of sudden depression of temperature, and atmospheric changes on different pigments and vehicles ?

(*Mr. Boxall.*) Perhaps our chairman will permit me to remind him of an experiment we made together some years ago on this subject, and to read the memorandum made at the time on the results :— "A hot iron held at some inches distance from a surface of asphaltum softens that surface, and on the withdrawal of the source of heat the surface contracts. Now it is physically impossible that contractions

W. Boxall,  
Esq., R.A.

2 Feb. 1870.

W. Boxall,  
Esq., R.A.

2 Feb. 1870.

should be absolutely uniform throughout the surface. Certain points will therefore in the first instance give way, rents and cracks being thus produced. Heat from any source whatever, whether it be the radiant heat of the sun, of a fire, of burning gas, or the heat of contact of the air, produces the same effect as the heat of the iron above referred to, and there cannot, I think, be a doubt that the deterioration of paintings in which asphaltum has been employed is hastened by an excessive heat followed by a chill. In other words, pictures in which asphaltum has been freely used are particularly liable to be injured by sudden changes of temperature."

659. (*The Chairman.*) From your knowledge of the galleries at South Kensington, after those things you have referred to have been properly attended to and remedied, do you consider that any further precautions require to be taken for the preservation of the pictures?—I should believe all possible precautions had been taken. I may be wrong in the opinion I have expressed as to the current of cold air admitted on lighting the gas, but it is a very strong opinion I have about it. I think the pictures now before you show the whole thing you want to know about pictures cracking.

660. (*Mr. Redgrave.*) I would ask Dr. Frankland whether mastic varnish has any peculiar contractile power in the drying?

(*Dr. Frankland.*) I do not know.

661. (*Mr. Redgrave.*) Because a great deal of evil has arisen to pictures from varnishing them with soft materials.

(*Dr. Frankland.*) No doubt.

662. (*Mr. Redgrave.*) I recollect an instance of a picture 20 or 30 years old—it is not an asphaltum picture—which I found to be cracked with white cracks down the whole of it when I returned after an absence of some weeks. I ascertained that it had been varnished in my absence, and it was the general opinion that the mischief had been occasioned by the contractile effects of the varnish.

(*Mr. Boxall.*) It had been put on too thick. A meglyp picture will crack 50 years after, when it has not cracked before. Many pictures I have painted in meglyp not varnished are as good as possible.

(*Dr. Frankland.*) I have seen instances in which the varnish on doors and panels of a room has shrunk to fully one fourth of the original surface, and the effect of that upon a picture may be easily conceived.

663. (*Mr. Redgrave.*) I should like the Committee to have the opinion of Mr. Boxall with respect to the putting of pictures under glass?—The only objection is that the pictures are not so well seen, but beyond question they are better preserved.

(*Mr. Redgrave.*) In the Sheepshanks gallery the glazing of the pictures has been carried to a considerable extent, particularly with the Mulready pictures, in order to preserve them in the state in which the artist left them. In the case of some of Leslie's pictures the varnish did not stand well, and glazing was adopted instead.

(*Mr. Boxall.*) In the National Gallery, Leslie's picture of "Sancho and the Duchess" has never been varnished—it had a dull surface—and the glass has proved better for it than varnish.

(*Mr. Redgrave.*) The glare occasioned by the glass is held to be objectionable, and converts the picture into an imperfect kind of looking glass, and that is more particularly the case with a dark picture when glazed. You can see your own reflection and that of the objects in the room, and that is not the best condition under which a painting can be seen.

(*The Chairman.*) I would just mention on this subject that on one of

my continental trips I carried with me a little instrument which had a surprising effect in dispelling the haze round objects in the distance, and which revealed them with startling distinctness, and in the case of pictures it completely quenched the glare and brought out the picture with great clearness. This instrument consisted of a piece of spar of a particular shape, and I call attention to it in connexion with this subject, and I shall be happy to submit it for your inspection, as I think something may be made of it; but whether it can be brought into use for dispelling the glare of pictures I must leave to be determined at a future time.

*W. Boxall,  
Esq., R.A.*

2 Feb. 1870.

## CONTENTS OF APPENDIX.

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### APPENDIX A.

	PAGE
MEMORANDUM by R. Redgrave, Esq., R.A. and W. Boxall, Esq., R.A., relative to the partial destruction of certain Pictures painted with Asphaltum, and to the properties of other Substances used in Oil Painting	78

---

### APPENDIX B.

MEMORANDUM by Captain Festing, R.E., on the Temperature maintained in the South Kensington Museum	78
---	----

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### APPENDIX C.

1. Report by Mr. J. C. Robinson on the preservation of the Raffaelle cartoons at the South Kensington Museum	81
2. Memorandum by Mr. R. Redgrave, R.A., relative to Mr. Robinson's report on the preservation of the Raffaelle cartoons	82
3. Report by Mr. R. Redgrave, R.A., on the state of the Raffaelle cartoons on their removal from Hampton Court Palace, in April 1865, and the nature of their accommodation at Hampton Court and at the South Kensington Museum respectively	83
4. Suggestions for the conservation of Raffaelle's cartoons, now at the South Kensington Museum, by R. Redgrave, Esq., R.A., and Sir Charles L. Eastlake, R.A.	85
5. Copy of a letter from the Right Hon. A. H. Layard relative to the foregoing Report and Suggestions	85
6. Report by Captain Festing, R.E., on the removal of the Raffaelle cartoons from Hampton Court Palace to the South Kensington Museum	86
7. Copy of a letter from Dr. Hofmann, F.R.S., dated 31st March 1865, relative to the preservation of the cartoons	86
8. Copy of a letter from Dr. Frankland, F.R.S., dated 31st May 1865, on the same subject	87

---

### APPENDIX D.

PAPERS handed in by Captain FOWKE, R.E.

1. Extract from a description of the Sheepshanks Gallery at South Kensington, by Captain Fowke, R.E.	87
2. Report by Captain Fowke, R.E., on Sunlight Burners	88

---

## APPENDIX E.

	PAGE
1. Report of the Commission appointed to consider the subject of Lighting Picture Galleries by Gas, dated the 20th July 1859	88
2. Copy of a letter from Professor Faraday, F.R.S., of the 12th of July, 1861, on the subject of the foregoing Report	89
3. Copy of a letter from Professor Tyndall, F.R.S., dated the 11th of July, 1861, on the same subject	90
4. Copy of a letter from Professor Hofmann, F.R.S., dated the 11th of July, 1861, on the same subject	91
5. Report by Dr. Frankland, F.R.S., of an Analytical Examination of the Gas supplied to the South Kensington Museum	91

---

## APPENDIX F.

1. Copies of letters from Sir Matthew White Ridley, Bart., dated respectively the 14th and 17th of June 1865, relative to the deterioration of pictures exhibited in the galleries of the South Kensington Museum	92
2. Memorandum by Mr. R. Redgrave, R.A., relative to the foregoing letters of Sir Matthew White Ridley, and to the condition of the pictures in the South Kensington Museum	94
3. Notes by Sir M. W. Ridley, and extracts from a report by Sir C. L. Eastlake, Mr. J. C. Robinson, and Mr. R. Redgrave, on certain pictures in the Vernon and Turner galleries at South Kensington	97

---

## APPENDIX G.

RETURNS showing the maximum variations in the Thermometric Readings in the picture galleries at the South Kensington Museum.

1. Temperature for the year ending 31st December 1861 in galleries containing the National Gallery pictures	99
2. Table showing the highest and lowest temperature, and the monthly and yearly average in the picture galleries, for 1862-63	100
3. Table showing the highest and lowest temperature, and the monthly and yearly average in the Sheepshanks Gallery, from 1858 to 1861 inclusive	101
4. Table showing the greatest variations of thermometric readings in rooms occupied by the National Gallery paintings	101
5. Comparative statement showing the thermometric readings in the picture galleries at the South Kensington Museum and at the National Gallery respectively, on the 22d of July 1869, at 4 p.m.	102

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## APPENDIX.

### APPENDIX A.

Memorandum by **MEMORANDUM** by R. REDGRAVE, Esq., R.A., and W. BOXALL, Esq., R.A., and Mr. Boxall, R.A., relative to the PARTIAL DESTRUCTION of certain PICTURES painted with ASPHALTUM, and to the PROPERTIES of other SUBSTANCES used in OIL PAINTING.

GENTLEMEN,

South Kensington, February 1870.

MR. BOXALL and myself were requested to state in writing our view of the causes that had led to the partial destruction of two pictures placed before you at your last meeting; one being "Sabrina," by H. Howard, R.A., the other "The Burial of the Knight," by the late Baron Leys. These works have only recently become the property of the Department, and were examined in order to show the state into which pictures painted with asphaltum almost necessarily fall wherever placed.

We explained that no pitchy preparations, whether called asphaltum, bitumen, or mummy, could dry so hard and firm as the other pigments of the painter. And that when painted over by such harder pigments, especially with a quick drying vehicle or varnish, the picture was sure to break up into wide pitchy fissures when the underground was brown, or if cracked to the priming of the canvas, into whitish fissures; while, if painted over by pigments in which white or light colours predominate, dark cracks would be seen, from the black pitchy undercolour becoming visible.

We also explained the mode in which Hilton, Howard, Wilkie, and other painters of that period used asphaltum.

Boiled linseed oil, asphaltum, and mastic varnish were placed separately on the pallet, and then mixed with the knife, forming a maglyp, which stood up like a jelly on the pallet. Those painters spread this medium over their pictures, and painted into it, and as the mixture never dried firmly, any varnish passed over the surface, or even the ordinary changes of temperature, were certain to break them up, and in such pictures no repairs are proof against the recurrence of the evil.

We also stated that the maglyp ordinarily used by painters, consisting of half-boiled linseed oil and half mastic varnish, would frequently crack even when no asphaltum is used on the picture being varnished, from the superior contraction of the mastic gum, as the spirit in which it was dissolved rapidly evaporates.

We have the honour, &c.,

(Signed) RICH. REDGRAVE.

W. BOXALL.

To the Commissioners on the Heating,  
Lighting, and Ventilation of the  
South Kensington Museum.

### APPENDIX B.

**MEMORANDUM** by CAPT. FESTING, R.E., on the TEMPERATURE maintained in the SOUTH KENSINGTON MUSEUM.

Memorandum by  
Capt. Festing,  
R.E., on the  
Temperature of  
the South  
Kensington  
Museum.

In accordance with the request of the Commission to prepare an analysis of the temperature in the Museum I have made the following tables. The "Western Gallery" mentioned below is that one of the old single-roofed rooms which now contains pictures forming part of the Townshend bequest, and in which there is usually the greatest variation. The thermometers are noted

every three hours during the day and night, and the register kept. The standard thermometer is hung on a stand on the grassplot in front of the official residences, and is sheltered from the direct rays of the sun.

I may mention that the night temperatures are noted, not by the men whose duty it is to keep up the heat, but by the police constables who would suffer if it were cold.

The first column of the tables shows the greatest variation in any one space of 24 hours during the year. The second, the mean of all the diurnal variations. The third, the minimum temperature noted during the year. The fourth, the mean of the mean temperature of each day and night. The last, the maximum temperature noted. The greatest diurnal variations are usually found in the early summer, when the galleries get warmed up by the sun, and from the comparative clearness of the atmosphere there is a considerable loss of temperature by radiation at night. In very hot, dry weather, some of the ventilators are occasionally left open at night so as to cool the building. This necessarily produces an increased variation.

Memorandum by  
Capt. Festing,  
R.E., on the  
Temperature of  
the South  
Kensington  
Museum.

	Diurnal Variation.		Temperature.		
	Max.	Mean.	Min.	Mean.	Max.
1867.					
Competition Gallery	13	4.5	45	60.8	80
New Sheepshanks, Centre Room	10	3.8	53	62.3	79
Raphael Gallery	12	4.6	52	61.7	80
Old Western Gallery	15	6	45	61.2	84
North Court, Centre	16	5.8	47	61.6	85
South Court, East Side	15	4.2	*39	60.7	76
Standard thermometer out of doors	30	13.5	6	50	87
1868.					
Competition Gallery	13	4	50	62	82
New Sheepshanks, Centre	11	4	52	63.2	84
Raphael Gallery	16	4.8	52	62.9	84
Old Western Gallery	15	5.8	48	62.3	89
North Court, Centre	11	5.1	52	62.4	82
South Court, East Side	10	2.9	53	62.2	80
Standard	31	14	27	52.8	92
1869.					
Competition Gallery	11	4	46	60.9	80
New Sheepshanks	14	3.9	49	61.4	81
Raphael Gallery	14	5	50	61.8	82
Old Western Gallery	16	5.6	52	61.1	83
North Court, Centre	15	4.7	53	61.3	78
South Court, East Side	9	3.7	53	61.3	78
Standard	33	12.3	27	50.8	88
THREE MONTHS ending 31st January					
1870.					
Competition Gallery	12	3.9	44	56.3	63
New Sheepshanks, Centre Room	7	3	55	59.4	67
Raphael Room	11	4	52	58.7	69
Western Gallery	8	3.9	53	57.6	64
North Court	8	2.9	53	58.1	66
South Court	8	3.1	53	57.6	64
Standard out of doors	20	7.9	23	40	59

\* This was before the iron building was removed. The temperature used to fall there very low at night; the draught of cold air thence to the warmer court impinged on the thermometer.

A Mason's hygrometer hangs in the Raphael Gallery, another on the same stand as the standard out of doors, and a third in the North Court. The register of the first two is kept.

Memorandum by  
Capt. Festing,  
R.E., on the  
Temperature of  
the South  
Kensington  
Museum.

Looking through the registers for the last two years, I find the greatest dryness noted in the Raphael Gallery has been shown by the thermometers being at 45° and 55° once in the winter, and at 65° and 80° in the summer; the saturation would be about 45 on each occasion.

I only find one instance (in September 1868) of the average saturation for a day being above .8 (which is I believe the limit of saturation for a healthy atmosphere). It was then .88, the extreme saturation during the day being .94. There are only two or three instances of the extreme saturation at any time being over .8. They are to be found, as might be expected, at the beginning of the autumn, when it is too warm to have the fires lighted, and the outside atmosphere is nearly (or quite) completely saturated.

The extremes of saturation during the last three months, with fires lighted, have been .45 and .74, and the mean .6.

The air of the North Court is, as a rule, slightly damper than that of the Raphael Gallery.

The greatest dryness of the outside air noted during the last two years has been with the thermometers at 72° and 92°, which indicate I believe .38 saturation. On another occasion it has been .4 (with thermometers at 56° and 72°).

In the old Sheepshanks Galleries the hot-water pipes run along the side walls, and are not covered by boards. To try what effect this may have on the pictures I have at different times put up a piece of wood with thermometers fixed to it at intervals so as to get the temperatures at different heights. I have found the temperature at the level of the pictures to be very little higher than that of the centre of the room. For instance, on the 5th inst., with the hot-water pipe as hot as it ever is—so hot in fact that the hand could not be kept on it for any length of time without pain—a thermometer with its bulb within an inch or two of the hot pipe indicated 84°; a second thermometer at one foot from the pipe and above it, 72°; a third at two feet, 68°; a fourth at four feet (which is about the level of the bottom of the pictures), 65°; a fifth at six feet, 65°. Above this there did not appear to be any diminution of temperature. A thermometer hanging at the doorway in the middle of the end wall of the room indicated 63 $\frac{1}{2}$ °.

It must be remembered that the nearest portions of the pictures are shielded from radiant heat by their frames; therefore, supposing that a thermometer with a clean glass bulb does not properly indicate the radiant heat, still the above-mentioned observations would, I think, show that the pictures cannot get unduly heated. No doubt a slight upward current of air over the face of the pictures is caused by the hot pipes, and it may be said that this current carries with it dust and dirt, but if the pipes were elsewhere, there would in all probability be a downward current, bringing an equal quantity of dust or dirt, or stagnation of air, in which case I should expect to find a greater deposition of dirt than in a current.

I believe that the right thing to consider is where fresh air can most conveniently be introduced, and that the pipes should be so placed that the fresh air should come in contact with them before diffusing itself in the room; but to say, regardless of this consideration, that along the walls is either the best or the worst place for the pipes seems to me unreasonable. In the case of an outside wall, I should consider it decidedly advantageous to place the pipes against it, as the upward current of warm air would, I fancy, tend very much to maintain a regularity of temperature at night or in very cold weather when the wall might be rapidly losing its heat; it would, too, prevent any condensation of moisture on the walls or pictures in a rapid change of the temperature and hygrometric condition of the atmosphere.

The general system of ventilation in the picture galleries is that fresh air is admitted at or near the floor level, and the foul air let out through ventilators in the skylights. Though no doubt liable to be influenced to some extent by the direction and force of the wind, the system answers well. Experiments made with smouldering brown paper show that there is a tolerably steady ascending current of air towards the ventilators after the gas has been lighted. There may doubtless be occasions when from the gusty state of the wind this becomes momentarily disarranged, and some of the products of combustion find their way into the room, but they must then be largely diluted with fresh air.

E. ROBERT FESTING,  
Captain R.E.

## APPENDIX C.

## (1.) REPORT BY MR. J. C. ROBINSON on the PRESERVATION of the RAFFAELLE CARTOONS at the SOUTH KENSINGTON MUSEUM.

(Referred to in Mr. Robinson's Evidence, Question 8.)

SIR,

April 29, 1865.

Report by  
Mr. Robinson,  
on the preserva-  
tion of the  
Raffaelle  
Cartoons.]

In respect to the preservation of the Raffaelle cartoons, whilst at South Kensington, I have, as requested by the Minute of the Lords of the Committee of Council on Education, to submit the following memoranda and suggestions:—

1. These cartoons have, for nearly two centuries, been preserved under conditions materially different from those they will now be submitted to.

2. On the whole, the conditions at Hampton Court have, in respect to these works, been comparatively favourable ones.

3. The cartoons are painted in distemper colours on paper, and their conservation demands conditions of an opposite nature to those which operate favourably for oil pictures. This is evidenced by the state of the oil *pictures* at Hampton Court, which is very bad, whilst the cartoons, on the contrary, are relatively well preserved.

There is a minimum of light at Hampton Court; this has caused the oil pictures to become dark, whilst, on the other hand, it has tended to prevent the fading of the cartoons.

4. The fading of the cartoons is inevitable, and the rate of deterioration depends on the greater or less amount of exposure to light which they receive. They should not in any case be exposed to more intense light than heretofore, and if possible the periods, or rather the entire average amount of exposure to light, should be lessened.

5. For instance, the gallery should be kept dark when the cartoons are not being exhibited to the public; and in particular, the light in the mornings, during the summer season, (before the hour of opening the gallery,) should be excluded.

6. A farther positive gain on the Hampton Court status might be effected by curtailing the periods of exhibition to the public by daylight. As it is they can be exhibited at Kensington by artificial light in the evenings, which would compensate for the loss of at least one day in the week, and at present they cannot be exhibited on the Sundays, as heretofore at Hampton Court.

7. (Perhaps, however, there would be no greater impropriety in their being exhibited at South Kensington on the *Sundays* than as at present at Hampton Court. Certainly no more appropriate public Sunday exhibition could be found than that of these cartoons, which constitute in themselves a most impressive pictorial exposition of Christian record. It would, in fact, be difficult to show why they should not be accessible to the public on Sundays as heretofore, and if their exhibition were conceded, the remainder of the collection could not remain closed.)

N.B. At the *Louvre* one section of works analogous to the cartoons, viz., the pen drawings of the old masters, are only exhibited during part of the day on Sundays, and this for two cogent reasons (not, it is true, necessarily relative to each other); first, that these works would rapidly deteriorate by continuous exhibition; and secondly, that the greatest number of the public have leisure to inspect them on the day in question. The minimum of damage to most precious works of art, and the maximum of advantage to the public, is thus secured.

8. A dry and somewhat heated atmosphere, not necessarily objectionable in the case of oil pictures, is the worst possible status of distemper vehicles, and in this respect the conditions of Hampton Court as regards the cartoons are better than those of South Kensington. At Hampton Court the atmosphere is, if anything, rather damp than dry, and this has probably tended to prevent the greatest drawbacks of distemper painting, viz., the liability of the vehicle or pigment to crack and scale off, and that of the paper ground to lift or cockle.

9. The cartoons are painted with size or some similar vehicle, which necessarily retains or has a natural affinity for moisture, and would suffer from undue desiccation; of all conditions, therefore, that of a uniform stagnant, dry, heated atmosphere would be the most inimical, but I fear the method of artificial

Report by  
Mr. Robinson,  
on the preserva-  
tion of the  
Raphaelle  
Cartoons.

heating at South Kensington especially induces these conditions. I believe that the present method of heating by hot-water pipes is, generally speaking, bad for nearly all classes of works of art, and that the arrangement of the pipes in the present galleries at South Kensington is especially and particularly objectionable.

10. The best method of heating galleries or apartments containing works of art is, I believe, by open fireplaces or stoves (as at the basement story of the British Museum), and that adequate ventilation and the maintenance of an equal temperature and proper atmospheric conditions can, I believe, be secured on no other system.

Exhibition by gaslight is a most suitable mode of displaying the cartoons and all analogous works in water-colours, the amount of fading from artificial light being almost infinitesimal.

Damage from exhibition by gaslight could occur only in one or two ways, viz., by an escape and admixture of gas in the air of the room, and the diffusion of the volatilized products of combustion therein; but I fear there is to a certain extent danger of this at South Kensington. The method of lighting is a comparatively rough and ready one, and until the source of light, *i.e.*, the gas burners, are entirely shut off and isolated from the containing spaces beneath their level, and all possibility of escape of gas into the galleries obviated by excluding the supply pipes from the interior of the same, the works of art contained cannot be said to be in absolute security.

Gas attacks certain pigments locked up in water-colour vehicles very speedily, and it is very probable that the cartoons are in parts executed with such changeable pigments.

In any case it should be borne in mind that the cartoons present a surface in the highest degree sensitive to atmospheric influences, even to mechanical ones, such as the deposition of dust and carbonaceous particles on them; that whilst an oil picture is protected by a kind of armour of resinous varnish, which can be mechanically cleaned, or even entirely removed, the oleo-resinous vehicle of the painting itself moreover being a defence, a distemper painting is entirely naked and defenceless, and when once its surface is attacked, the evil admits of no effectual remedy.

The cartoons at South Kensington will, I think, on the whole, be placed in somewhat less favourable conditions than heretofore at Hampton Court, unless special and carefully considered measures are devised to obviate the detrimental influences in question.

(Signed) J. C. ROBINSON.

The Secretary,  
Science and Art Department.

Memorandum  
by Mr. Redgrave,  
R.A., on the  
foregoing Report.

(2.) MEMORANDUM by Mr. R. REDGRAVE, R.A., relative to  
Mr. Robinson's Report on the Preservation of the Cartoons.

I CANNOT concur in some of Mr. Robinson's conclusions, and others have been met and proposed by myself in my late report (*vide infra*, pp. 83 and 85). In that report I have given my reasons why the conditions under which the cartoons were exhibited at Hampton Court were in some respects dangerous, in others unfavourable.

As to the proposed method of warming the galleries by open fire places, surely such are objectionable on all grounds.

First, the great length of gallery would not by such means be kept at any equality of temperature throughout.

Secondly, open fireplaces induce visitors to congregate around them, a subject of great inconvenience; and, from the great warmth near the grate, engender a sense of even greater inequality at a distance from it than really exists.

Thirdly, some of the proceeds of combustion in stormy weather and at change of winds will be likely to escape into the room.

Fourthly, open fireplaces, with the dangers incidental to lighting the fires, &c., are of the most objectionable nature in public museums, and would be still more so near the cartoons. What possible security could be found against fire? One of the dangers at Hampton Court arose from pipe stoves, while

most of our public places are warmed by hot air or hot water. I do not understand Mr. Robinson's remarks as to a "rough and ready mode of lighting." In the former report on the gas lighting, it was thought better that the gas should be within the room; the means of lighting it are excellent.

I believe that although the *public* of Paris are only admitted to see the drawings in the Louvre on Sunday, they are uncovered at other times, and foreigners and others visit them *daily*.

The damp atmosphere of Hampton Court has not prevented the distemper painting of the Mantegna Triumphs peeling off in large quantities.

I have already recommended many precautions for the preservation of the cartoons; at my suggestion they were placed under glass and otherwise protected. And I would recommend further, that a proper examination of the whole subject should be made by persons specially qualified.

RICHD. REDGRAVE.

Memorandum  
by Mr. Redgrave,  
R.A., on the  
foregoing Report.

(3.) REPORT on the STATE of the RAFFAELLE CARTOONS on their Removal from HAMPTON COURT PALACE in April 1865, and the NATURE of their ACCOMMODATION at HAMPTON COURT and at SOUTH KENSINGTON respectively.

Report on the  
Raffaelle  
Cartoons, by  
Mr. R. Redgrave.

May 19th, 1865.

When the present surveyor of Crown pictures came into office in 1858 he found these valuable works liable to serious injury and suffering great dilapidation. The gallery in which they were placed was ill warmed during the winter months by a stove in the centre and a long pipe passing into the chimney under the cartoon of "The Miraculous Draught of Fishes," leaving the distant ends of the gallery in unequal temperature and subject to cold and damp. The fire was only lighted six days in the week, the room being cold and damp and the temperature dangerously lowered on the seventh. The windows looked out into a small court of the nature of a well, since there is a large basin at the bottom, and high surrounding buildings which prevent the wind from ventilating it.

The long room, said to have been built by Sir C. Wren for these cartoons, is floored and lined throughout with wood, and it is believed that one or more flues from the kitchens of the residences beneath pass horizontally under the wooden floor of the gallery.\* Through this gallery during the year some 200,000 people passed, raising clouds of dust which gradually was deposited on the surface of the cartoons. This, from their fragile state, and the unprotected nature of tempera painting, could not be removed except by a most experienced and trustworthy person, and none such had been employed for some years. The cartoons, during the last half century, and before they came under my charge as surveyor, had been taken from the stretchers, *rolled* up and sent to various palaces, to the British Institution to be exhibited, and to the Royal Academy for the students to copy. The frames also have been made to fold horizontally, and they have been so folded (of course with a great loop, but necessarily), to the great injury of the dry and fragile paper on which the cartoons are painted. Tracing also was allowed, and I have seen large sheets of tracing paper pinned on to the cartoons, and a hard pencil used to trace the lines—to the great injury of these precious works, the more so that the outlines have all been pricked through for pouncing, and any following by the point over the outlines must press into these holes and cause them to break together. Moreover, persons have been allowed, without due supervision, to copy these works in oil as well as in water colours, a scaffold having been provided for their accommodation; thus, colour has been thrown over parts of them, they have been touched with the brush in matching tints, by falling tools, and by dirty mahl sticks; and thus many injuries have been added, as well as by the spilling of water, which also has evidently flowed over them in many places, perhaps through the ceiling, from residences above the gallery.

\* "I was told that Mr. Wingfield the artist gave notice of a smell of fire, and that it was many hours before they found it, still smouldering, from one of these flues. This is five or six years ago. I have myself seen the floor opened to look after one of these flues."—R. R.

Report on the  
Raffaele  
cartoons, by  
Mr. Redgrave.

One of the first efforts of the present Crown Surveyor was to have these precious and invaluable works protected from fire, from damp, and from the other injuries which have been named. To protect them from fire, an ingenious but somewhat elaborate set of machinery was devised by the Officers of the Board of Works, to admit of the pictures being lowered, removed from their frames, and folded in half so as to pass through the doors that lead to the gallery. Stand-cocks were fixed in the rooms, and the best directions given to the attendants on their use, but as the Chief Warder did not live in the Palace (nor indeed within a mile), as no police or night watchmen paraded the closed rooms, and it would be necessary to lower and fold each cartoon to enable it to be passed through the doors, there can be little doubt that in a place lined with dry wood the fire would have blazed so freely that it is hardly possible one would have been passed out before the whole were in a blaze. Against dust and change of temperature the plan adopted was to seal up the cartoons in front with large sheets of plate glass. This has been a great security, as also against any possibility of knocking off the loose hanging pieces of these friable works, but it has been attended with a serious inconvenience. The works ill seen and ill lighted before, had, from their glazing, become so many mirrors to reflect the windows of the gallery directly opposite to them, and thus almost wholly to prevent the pictures being seen, a defect which it was impossible to remedy except by lighting them from the top. It was intended also to seal the pictures up at the back with painted cloth, but this highly necessary work remains yet to be done. In view of all these dangers, dangerous influences, and difficulties of study, the Crown Surveyor, when requested by the First Commissioner in 1864 to report if there would be serious danger in removing the cartoons to the National Gallery in Trafalgar Square, was obliged to report that all circumstances considered he could not make objections to their removal, and when in the present Spring Her Majesty was graciously pleased to allow of their exhibition for a time at South Kensington, it was manifest that he could still less object to the purer air of that Museum, in which, moreover, the light would be carefully regulated, the temperature preserved at an equality, where there are the best provisions against dust, and ample security against any danger from fire, since the buildings are not only constructed as far as possible fireproof, but police and firemen perambulate the building day and night. There too these noble works, the property of the Crown, would be made available to a far larger public than at Hampton Court, be seen in a top-lighted gallery in company with other decorative inventions of the great master, and in immediate contiguity with the manufactures which the influence of his genius has so manifestly pervaded—a plan originally suggested by the Prince Consort, and urged more recently by the Princess Royal.

It remained, therefore, to make the most thoroughly well considered arrangements for their safe removal from Hampton Court. This was effected without the slightest injury or accident. The manner of doing it, and the report on the removal by Captain Festing, is subjoined. (*See infra* 6, p. 86.)

It was necessary to take careful notes of the state of the whole on their arrival, in order that what injuries they have heretofore suffered may be carefully noted, as well as the natural decay of age. This has been done, and a record made in the form of notes marked upon photographs of the cartoons.\* The suggestions of what appears best calculated to prevent, as far as possible, or at least retard the natural progress of decay, will be found at the end of this report. (*See opposite* 4, p. 85.)

In reference to the register of dilapidations, it must be evident that in going over so large a surface as that of each cartoon, it is only the most noteworthy injuries that could be registered, and that extensive injuries of a minute nature—such as abrasions of their surface or scaling of tints—could hardly be included, although using the photographs as the basis of the registry has been a great aid; neither could the numerous corrugations and cracks be thoroughly noted.

RICHARD REDGRAVE,

Inspector-General for Art.

\* These photographs and notes may be seen at the South Kensington Museum.

(4.) SUGGESTIONS for the CONSERVATION of RAFFAELLE'S CARTOONS,  
now at the SOUTH KENSINGTON MUSEUM, by R. REDGRAVE, Esq.,  
R.A., and Sir CHARLES L. EASTLAKE, R.A.

The Department having been intrusted by Her Majesty with the temporary care of these invaluable works, the following are among the means that should be adopted to ensure their safety and security from any detrimental influence from atmosphere, &c.

As much of the paper of the cartoons is loose from the canvas, and many small pieces of the surface paper from the substratum, they should be replaced under glass as speedily as possible, the joints of the glass carefully sealed with gutta percha and gold beater's skin, and the backs, as recommended some years ago, covered throughout with painted cloth.

Great care should be taken in fixing the frames to the wall to secure them from any chance of falling forward with the great weight of glass.

The skylight should be carefully covered throughout to lower the light, and to prevent any direct ray of the sun from reaching them.

Curtains or blinds should be placed over each cartoon to be drawn over it when the exhibition closes, in order to cover them at all hours when the public are not admitted.

The ventilation should be at once attended to, to ensure the products of combustion of gas being wholly removed, as was reported to be the case when the galleries were examined by Messrs. Faraday, Hofmann, and Tyndall.

Before the gallery is again warmed by the hot water pipes, I would suggest that these pipes should be removed from under the cartoons into the middle of the long gallery, and that air be freely admitted from without over the pipes so placed.

The hygrometric state of the atmosphere in the rooms should be tested from time to time, and its temperature regularly registered night and day.

It is unnecessary to urge every attention on the part of police and firemen, as this is given throughout the Museum.

It will be seen that no repairs of any kind are contemplated; such should never take place without a full examination by competent authorities, and a full report as to the extent and mode of procedure.

(Signed) RICHARD REDGRAVE.

I beg to say that I approve of the above suggestions, and I entirely concur in the opinion that no repairs of any kind should be at present undertaken.

(Signed) C. L. EASTLAKE.

24th May 1865.

(5.) COPY of a LETTER from the Right Hon. AUSTEN H. LAYARD,  
relative to the foregoing REPORT and SUGGESTIONS.

SIR, 130, Piccadilly, May 9th, 1865.

In compliance with the wish of the Lord President, I have inspected the Raffaelle cartoons which have been removed from Hampton Court Palace to the South Kensington Museum. Mr. Redgrave has submitted to me the notes he has made on the present state of these works, and his suggestion for their preservation whilst at Kensington.

I consider Mr. Redgrave's notes of much value, as recording the actual condition of the cartoons when removed from Hampton Court. They appear to me to have been very carefully and accurately made.

I entirely concur with Mr. Redgrave in his suggestions as to the precautions to be taken for preserving the cartoons, and I am of opinion, with him, that no attempt whatever should be made to clean or restore them. I cannot urge this too earnestly upon those who will have the custody of them. The only suggestion I have to make, in addition to those made by Mr. Redgrave is, that such parts of the paper as are detached or in danger of falling off from the canvas backing should be fastened down. It appears to me that this is necessary for the actual preservation of the works, and cannot properly be called "restoring." There are pieces of the cartoons in important parts which are only hanging by a strip. In other places or at the outer edges the paper is peeling off from the backing. I think it very important that further mischief should be stopped at once by fastening down the paper at such places.

Letter from Mr.  
A. H. Layard,  
relative to  
the foregoing  
Report and  
Suggestions.

Letter from Mr.  
A. H. Layard,  
relative to  
the foregoing  
Report and  
Suggestions.

It was with great satisfaction that I found the cartoons in far better condition as regards former restorations than I had expected. A great part of these invaluable works appears to be in a very pure state. It might be interesting, now that there is an opportunity of examining them carefully, to ascertain and record, as far as possible, what parts of the cartoons have been restored and what parts are in their original state, affected only by the accidents of time and neglect.

I have the honour, &c.,  
(Signed) A. H. LAYARD.

Report by  
Capt. Festing,  
on removal of  
Cartoons from  
Hampton Court.

(6.) REPORT by Capt. FESTING, R.E., on the REMOVAL of the RAFFAELLE CARTOONS from HAMPTON COURT PALACE to the SOUTH KENSINGTON MUSEUM.

The removal of the Raffaelle cartoons from Hampton Court Palace to the Museum took place at the end of April 1865, under the direction and superintendence of Captain Fowke. The first operation in moving the cartoons was taking them out of their frames, which occupied two days. A large van carrying, by india-rubber slings, a case of sufficient size to hold all the cartoons was specially made from the designs of Captain Fowke; it was brought down by night to the palace, and soon after daylight the following morning we commenced the work of lowering the cartoons from a window of the room in which they were, and packing them in the van. Captain Fowke superintended the latter part of the operation, having stationed me on the scaffolding outside the window to see that they were carefully taken down. We both accompanied the van on its journey by road to London, which was performed without the smallest accident, and by four o'clock in the afternoon the cartoons were all safely lodged in their new gallery without having sustained the slightest injury, the whole of the work having been done under the direct supervision of Captain Fowke and myself, and every precaution taken that the faces of the cartoons should not be touched. The extent of this work may be judged from the fact that the case for the cartoons measured 18 feet by 12 by 4, and the van was 20 feet long by 8 wide, and 18 feet high to the top of the framing, and was drawn by eight horses. About 40 workmen were employed in the work. The cost of the service was about 250*l.*

A room had been specially arranged for the cartoons, the hot-water pipes having been removed from along the walls and placed down the middle of the room in trenches made in the thickness of the floor. This alteration has been attended with very good results, and the warming and ventilation of the room are very satisfactory. A blind is fixed over the skylight to keep out the light of the sun, and there are green blinds under it, which are drawn when the room is not open to the public, or when there is too much light.

(Signed) E. ROBERT FESTING, Captain, R.E.

8th May, 1865.

Letter from  
Dr. Hofmann,  
relative to the  
preservation  
of the Cartoons.

(7.) COPY of LETTER from Dr. HOFMANN, F.R.S., dated 31st March, 1865, on the PRESERVATION of the CARTOONS.

Royal College of Chemistry,

March 31, 1865.

MY DEAR SIR,

HAVING conjointly with Mr. Faraday, Professor Tyndall, Mr. Redgrave, and Capt. Fowke, examined into the subject of lighting picture galleries by gas, and remembering how well colouring was preserved at the South Kensington Museum, I have no hesitation in expressing my opinion that with the system of cleanliness and ventilation which prevails at the Museum, the cartoons of Raffaelle, when well glazed, could be preserved in that establishment without the slightest injury. To increase the protection, I would suggest to place the cartoons between *two* sheets of plate glass, and to prevent dust getting at the joints, to cover the joints with a layer of transparent gelatine.

I remain, &c.

Henry Cole, Esq., C.B.

(Signed) A. W. HOFMANN.

(8.) COPY of LETTER from Dr. FRANKLAND, F.R.S., dated 31st May, 1865, containing SUGGESTIONS relative to the PRESERVATION of the RAFFAELLE CARTOONS.

Letter from Dr. Frankland, on the preservation of the Cartoons.

Royal Institution of Great Britain, Albemarle St., W.,  
May 31st, 1865.

SIR,

In compliance with the wish of the Lord President, expressed in your letter to me, bearing date May 6th, 1865, and numbered M 10153, I have, in company with Mr. Redgrave, R.A., inspected the Raffaelle cartoons which have been removed from Hampton Court, and which are now about to be exhibited at the South Kensington Museum.

I am also in receipt of Mr. Redgrave's report on the present condition of the cartoons, and have before me the report of the Commission appointed to consider the subject of lighting picture galleries with gas.

My inspection of the cartoons, and of the gallery in which they are to be placed, leads me to concur entirely with the suggestions contained in Mr. Redgrave's report, and I would beg to call especial attention to his recommendation that no repairs of any kind—such, for instance, as the pasting down of the loose pieces of paper upon the canvas—should at present be undertaken. Such repairs could in no way contribute to the preservation of the cartoons, and, unless executed with the observance of great precaution, would be very likely to initiate a decay which it would be afterwards difficult to arrest.

I would also further suggest that provision should be made at the back of each cartoon, for the introduction of a zinc box, with perforated cover, containing about 7lbs. of quicklime, to be renewed once a fortnight. Of all causes predisposing to decay, the deposition of moisture upon the cartoons is most to be dreaded, and it is to be feared that this will frequently occur when the temperature of the gallery is rather suddenly lowered—as, for instance during the night succeeding an evening exhibition of the cartoons by gas-light. Quicklime used as now suggested, would maintain the air between the glass and back of each frame in such a condition of comparative dryness as to prevent the possibility of any deposition of moisture even during a very sudden reduction of temperature. It would also have the effect of absorbing any deleterious gases which, through accidental interruption of the ventilation, or other cause, might gain admission within the frames.

I have the honour to be, &c.,  
(Signed) E. FRANKLAND.

Henry Cole, Esq., C.B., &c., &c.

#### APPENDIX D.

(Papers handed in by Captain Fowke, R.E.)

(1.) EXTRACT from a DESCRIPTION of the SHEEPSHANKS GALLERY at SOUTH KENSINGTON, by CAPTAIN FOWKE, R.E.

Although the principle of extraction employed in this case is perfectly successful in ventilating the galleries, yet in an atmosphere like London where a great deal of impurity is present, I think a better way of ventilating a picture gallery would be to supply it with air by mechanical means in such quantity that it should always be as it were in a state of repletion or compression, and the advantage of such a method would be that at any opening the air would have a tendency to escape from the building; at each opening of the door a current would set outward which would easily be regulated to a given strength, and thus the entrance of outward air and its accompanying impurities would be entirely prevented.

The air supplied to the building might be dried or damped or heated to any required degree according to the state of the atmosphere, and should also be passed through screens, so as to ensure its being free at least from all mechanical impurities, and probably it would not be difficult to absorb or disengage some of its chemical ones as well, and by employing such precautions even a neighbouring factory would cease to be a source of alarm to the collector.

Observations by Capt. Fowke, R.E., on the Ventilation of the Picture Galleries.

Observations by  
Capt. Fowke,  
R.E., on the  
Ventilation of  
the Picture  
Galleries.

The mechanical contrivances for effecting the supply of air are quite simple and inexpensive. A small noiseless fan, driven by even so low a power as a four or six horse engine would, I am convinced, be amply sufficient to supply a museum or gallery of considerable magnitude in which it would, I have no doubt, keep marbles or pictures in quite as good a state as if they were placed in a country district 100 miles from a town or a manufactory.

Report by  
Capt. Fowke,  
R.E., on sun-  
light burners.

(2.) REPORT by CAPTAIN FOWKE, R.E., on SUNLIGHT BURNERS.

May 1865.

The experience which seems to be deducible from an examination of the working of sunlight burners generally, and more especially those now in use in the Museum, in the rooms under the schools, is that the chimneys of sunlight burners are in most cases made much too small, so that they are often incapable of taking off even the product of combustion of the gas, much less of affording any efficient ventilation for the room in which they may be placed, and that as regards the light derived from such burners it is too concentrated to be at all suitable (as at present applied) for the exhibition of small objects, more particularly those in relief, and which, from being of a dark colour, do not obtain reflected light in their shaded parts. With a view of remedying these two defects as much as possible, it is suggested that in any place in which it may in future be decided to use sunlight burners, they should be employed of a much smaller size, and be placed at shorter distances apart than has hitherto been the case. In the new corridors of the lecture theatre building it is suggested that there should be one such small sunlight between each pair of iron joists, or about one-sixth inch apart, and with a proper chimney provided in the thickness of the concrete floor. For the library and cloisters of the north court, as this would now be an expensive process, it would perhaps be sufficient to place a small sun-burner at each 5 feet in length of the room, carrying a small earthen-pipe flue in the concrete of the floor above. These pipes could terminate on the court side in the hollows already existing in the walls of the court, and on the library side could be carried up outside the building to a sufficient height to ensure a proper draught.

(Initialled) F.F.

APPENDIX E.

Report, dated  
20th July 1859, of  
Commission on  
Lighting Picture  
Galleries by Gas.

(1.) REPORT of the COMMISSION appointed to consider the subject of  
LIGHTING PICTURES GALLERIES by GAS, dated the 20th July, 1859.

The Commission, consisting of Professors Faraday, Hofmann, and Tyndall, Mr. R. Redgrave, R.A., and Captain Fowke, R.E.,—appointed for the purpose of reporting to the Lords of the Committee of Privy Council on Education *On the Lighting of Picture Galleries by Gas and on any precautions (if necessary) against the escape of Gas, and the products of its combustion*,—having met at various times and considered the subject referred to them now make the following report.

There is nothing innate in coal gas which renders its application to the illumination of picture galleries objectionable. Its light, though not so white as that of the sun, is equally harmless; its radiant heat may be rendered innocuous by placing a sufficient distance between the gas jets and the pictures, while the heat of combustion may be rendered eminently serviceable in promoting ventilation.

Coal gas may be free from sulphuretted hydrogen compounds, and in London is so at the present time; it then has little or no direct action on pictures. But it has not as yet been cleansed from sulphide of carbon, which, on combustion, yields sulphurous acid gas capable of producing 22½ grains of sulphuric acid per 100 cubic feet of present London coal gas.\* It is not safe to permit this

\* Hofmann.

product of the combustion to come in contact with pictures, painted either in Report, dated  
or water colours; and the Commission are emphatically of opinion that in 20th July 1859, of  
every system of permanent gas lighting for picture or sculpture galleries pro- Commission on  
motion should be made for the effectual exclusion or withdrawal of the products Lighting Picture  
combustion from the chambers containing the works of art. Galleries by Gas.

The Commission have examined the Sheepshanks' Gallery as an experimental  
attempt to light pictures with gas, and are of opinion that the process there  
carried out fulfills the condition of effectually illuminating the pictures and at  
the same time removing the products of combustion. According to the indica-  
tions of the thermometer required and obtained, it does this in harmony with,  
and in aid of, the ventilation, and does not make a difference of more than one  
degree Fahrenheit at the parts where the pictures are placed, between the  
temperatures, before and after the gas is lighted.

Certain colour tests consisting of surfaces covered with white lead, or with  
vegetable and mineral colours (especially the more fugitive ones), and in which  
also boiled linseed oil, maglyp, and copal varnish were employed as vehicles,  
had been prepared, and were, when dry, covered one-fourth with mastic varnish,  
one-fourth with glass, one-fourth with both mastic varnish and glass, and one-  
fourth left uncovered. Sixteen of these have been placed for nearly two years  
in different situations, in some of which gas has been used, in others not.  
They give no indications respecting the action of coal gas (except injury from  
heat in one placed purposely very near to and above the gas burners), but seven  
of them show signs of chemical change in the whites, due to either a town  
atmosphere or want of ventilation. The most injured is that from the National  
Gallery, Charing Cross, and the next is from a country privy; the third, much  
less changed, is from the House of Commons; the fourth is from the Barber  
Surgeons' Hall; the fifth from the Bridgewater Gallery; the sixth from the  
Royal Society's Rooms, Burlington House; the seventh from the British  
Museum.

The remaining tests hung in—

1. Sheepshanks' Gallery, South Kensington.
2. Secretary's Room at South Kensington, where no gas is used.
3. Mr. Henry Drummond's Drawing-room at Albury Park, Surrey.
4. Sealed up and kept in a closet in the Secretary's Room at South  
Kensington.
5. Lambeth Palace, Vestibule of the Staircase.
6. British Institution, Picture Gallery.
7. Windsor Castle, Room with a north aspect without gas.
8. Mr. Thomas Baring's Picture Gallery, 41, Upper Grosvenor Street,  
frequently lit with gas.

present no observable change in this respect.

Though apart from the especial subject submitted to the Commission, its  
members cannot resist a recommendation that this kind of trial, which is  
especially a painter's experiment, should be continued for a longer period, and,  
indeed, be carried out on a more extensive scale.

The Commission think it right to state that they are unanimous on all the  
points to which their attention had been called, or which are referred to in this  
report.

(Signed)

M. FARADAY.

A. W. HOFMANN.

JOHN TYNDALL.

RICHD. REDGRAVE.

FRANCIS FOWKE, Capt. R.E.

South Kensington, 20th July 1859.

.) COPY of LETTER from Professor FARADAY, F.R.S., Royal Institu-  
tion, on the subject of the foregoing Report.

Y LORDS,

July 12th, 1861.

A COMMISSION, of which I was a member, was appointed in the summer  
1859 to consider the lighting of picture galleries by gas, and the manner in  
which that object had been attained in the Sheepshanks Gallery at Kensington.  
The Commission made their report in favour of that application on the 20th of  
July 1859.

Letter from  
Professor  
Faraday, F.R.S.,  
relative to the  
foregoing Report.

Letter from  
Professor  
Faraday, F.R.S.,  
relative to the  
foregoing report.

I have been desired to re-observe the gallery with reference to the temperature communicated by the gas to the woodwork nearest to it. By the application of thermometers against the woodwork above and nearest to the gaslights, it has been ascertained that at the present date the action of the heat after an hour's continuance has been an elevation of temperature equal occasionally to  $12^{\circ}$  or  $13^{\circ}$ , *i.e.*, the woodwork, which before gas lighting was at  $71^{\circ}$  became  $84^{\circ}$  in the course of an hour or so, and did not rise after any longer time. In the Sheepshanks Gallery the skylight is double, and serves as the hot air exit passage. The air in that passage being  $75^{\circ}$  before lighting, became  $91^{\circ}$  an hour after, and rose no higher. The part of the gallery below the top of the pictures was not raised in temperature more than two degrees by the lighting of the gas.

I have no change to make in any of the conclusions contained in the former report, and as looking at the Sheepshanks Gallery at the time as an experimental attempt to light pictures by gas, am still of opinion that the process then carried out fulfils the condition of effectually illuminating the pictures, and at the same time removing the products of combustion; but I desire to add the recommendation that the roofs of such galleries be of iron.

A paper has also been submitted to me containing letters by Mr. Braidwood and Mr. Sydney Smirke, of the 11th and 12th April 1861, regarding the application of gas to the lighting of the British Museum. It forms a report to the trustees. The British Museum and the Kensington Galleries differ so much, that opinions proper to the one may have no application to the other. Many of the objections made by Mr. Braidwood, in respect of the British Museum, of which case alone he speaks, are met by Mr. Smirke; as the removal of all mischievous vapours, and the safe conduction and dispersion of heat, objects which can be attained, according to Mr. Smirke, by sufficient contrivance and outlay. But I should greatly hesitate to recommend gas-lighting in the British Museum against the opinion of the architect, who alone is aware of the construction of the building, and also of the dangers by fire which it may involve. Further, I am very strongly against the common practice of erecting a church or other building by one set of hands under one mind, and then giving it over to another authority and set for the introduction of gas apparatus and pipes, or pipes of hot air or water (frequently at high temperatures and pressures) into parts and places where no intention respecting them had existed before; where no preparations had been made for them; and where the final arrangements must partake more of accident and risk than of premeditation and forethought.

I have, &c.

(Signed) M. FARADAY.

To the Lord President and Vice-  
President of the Committee of  
Council on Education.

Letter from  
Dr. Tyndall  
relative to the  
Report of the  
Commission of  
1859.

(3.) COPY of LETTER from Professor TYNDALL, F.R.S., Royal Institution, dated the 11th July, 1861, on the subject of the Foregoing Report of the 20th July 1859.

MY LORDS,

I HAVE this day re-perused the Report on the Illumination of the Picture Galleries of the South Kensington Museum, bearing date the 20th of July 1859, and beg to state that I see no reason to deviate from the opinion embodied in that report.

With reference to the question raised by the letter of Mr. Braidwood, to which my attention has been directed, I have to state that, with the observed temperatures of those portions of the gallery which are most exposed to the action of the gas before me, it is my opinion that no danger can arise from such elevations of temperature as the gas applied as at present is competent to produce.

Such elevations of temperature are indeed very much less than those effected by the solar heat, in a room roofed by glass, upon an ordinary summer's day. In presence of these facts, I do not hesitate to express the decided opinion that no danger is to be apprehended from the mode of illumination now in use at South Kensington.

I have, &c.

(Signed) JOHN TYNDALL.

Thursday, 11th July 1861.

## (4.) COPY OF LETTER from Professor HOFMANN, F.R.S., Royal College of Chemistry, on the same subject.

Royal College of Chemistry,

Letter from  
Dr. Hofmann, on  
the Report  
of 1859.

MY LORDS,

I HAVE been requested to peruse letters addressed by Mr. Braidwood and Mr. Sydney Smirke to the principal librarian of the British Museum, on the proposal of lighting that institution by gas, and to reconsider, with especial reference to the opinion expressed therein, the conclusions arrived at by a Commission consisting of Professors Faraday and Tyndall, Mr. Redgrave, R.A., Captain Fowke, R.E., and myself, appointed for the purpose of reporting to the Lords of the Committee of Privy Council on Education, on the lighting of picture galleries by gas, and on any precaution (if necessary) against the escape of gas and the products of its combustion.

With the view of obtaining additional information upon this subject, I have carefully examined the indications of the thermometers in the several galleries at the South Kensington Museum, registered in exposed parts of the room, and on the principal of the roof between the two skylights, whilst the galleries were lighted.

I have also examined the temperature between the two skylights during the daytime, and find that this morning (July 11) between 11 and 12 o'clock, the sun being frequently clouded, the temperature of this span was 95°, actually a few degrees higher than the highest temperature registered during the evening, when the gaslights were burning.

Having thus carefully considered the question addressed to me, I do not see any reason to alter or qualify the opinion expressed in the report above referred to.

I have, &c.  
(Signed) A. W. HOFMANN.

To the Lord President and Vice-President of the Committee of Council on Education.

## (5.) COPY OF a REPORT by DR. FRANKLAND, F.R.S., of an ANALYTICAL EXAMINATION of the GAS supplied to the SOUTH KENSINGTON MUSEUM.

Royal College of Chemistry,

February 13th, 1868.

Report of  
Analysis, by  
Dr. Frankland,  
of the Gas  
supplied to the  
South Kensington  
Museum.

SIR,

In compliance with your request contained in Mr. Norman MacLeod's letter, I have analytically examined the gas supplied to the South Kensington Museum, and have to report that it is perfectly free from sulphuretted hydrogen, but it contains impurities, sulphur ammonia, and carbonic acid, in the following proportions:—

Sulphur	-	-	12.583 grains in 100 cubic feet.
Ammonia	-	-	27.768 grains in 100 cubic feet.
Carbonic acid	-	-	.016 cubic foot in 100 cubic feet.

The most deleterious of these impurities is the sulphur, which during the combustion of the gas is converted into sulphuric acid.

By the Gas Act of 1860, the metropolitan companies are permitted to send out gas containing 20 grains of sulphur in 100 cubic feet; but with the sole exception of the Western Gas Company they all constantly infringe this Act. Thus, at the present time the gas supplied by the Chartered Company to this college contains 38 grains of sulphur in 100 cubic feet. As sulphur is the impurity most likely to cause injury to works of art, the South Kensington Museum is peculiarly fortunate in being within the district of the only company which does not distribute gas containing an excessive amount of this impurity.

On the other hand, the gas contains a very large quantity of ammonia; but this impurity is chiefly objectionable in the unburnt gas. It corrodes the brass portion of gas fittings, and if the gas so contaminated be allowed to escape unconsumed into apartments, it can scarcely fail to act injuriously upon brasses, bronzes, and several of the pigments used by artists.

Although chiefly objectionable in the unburnt state, ammonia is not quite harmless when burnt, since a small proportion of it is converted into nitric acid

Report of  
Analysis, by  
Dr. Frankland,  
of the Gas  
supplied to the  
South Kensington  
Museum.

Fortunately it is a very small proportion only which is thus converted into this very corrosive material. I find that the combustion of 100 cubic feet of the gas used in the South Kensington Museum produces only 1·064 grain of nitric acid, whereas if the whole of the ammonia present in the gas were converted into this compound, 100 cubic feet of the gas would yield 102·9 grains of nitric acid.

The Gas Act of 1860 provides that no gas shall be sold in London which contains so much ammonia as to cause yellow turmeric paper to turn brown, when the unignited gas from a jet emitting five cubic feet per hour is allowed to impinge upon it for one minute. Now, a jet of gas in the South Kensington Museum browns turmeric paper in less than one second. The Gas Act is well known to be inoperative, and consequently the Western Company would probably refuse to remove the ammonia, although the operation is very simple and inexpensive. If this should be the case, and you consider its removal to be desirable for the greater security of the works of art in the South Kensington Museum, I shall be happy to confer with your engineer respecting the construction of a simple apparatus for its removal upon your own premises.

The third impurity, viz., carbonic gas, is present in too minute a proportion to be in the slightest degree objectionable.

I have, &c.

E. FRANKLAND.

Henry Cole, Esq., C.B.

#### APPENDIX F.

Letters of Sir  
M. W. Ridley,  
relative to  
alleged deter-  
ioration of  
pictures at  
South Kensing-  
ton.

(1.) COPIES OF LETTERS from SIR MATTHEW WHITE RIDLEY, Bart., of 14th and 17th June 1865, relative to the DETERIORATION OF PICTURES exhibited in the GALLERIES of the SOUTH KENSINGTON MUSEUM.

(Referred to in Sir M. W. Ridley's Evidence, Question 117.)

10, Carlton House Terrace, S.W.,  
June 14, 1865.

DEAR SIR

I AM in receipt of yours of yesterday from South Kensington Museum. In reply to it I may state that I did say "that in my observation certain pictures had suffered by the admission of hot air from the perforated trellis immediately below them at the South Kensington Museum, since their removal from Marlborough House." I am of that opinion. I formed it some six months or more ago, and I believe it to be shared by persons more competent to pronounce one than I claim to be.

I cannot quote you off any number of pictures, but in illustration I could name one that was in Marlborough House which seems to have gone through a process of disintegration since its removal, viz., a landscape by the late Sir A. Callcott.

I have been more than once at the South Kensington Museum since the meeting of Parliament, but not recently. I made no notes at the time, but will take an early opportunity of re-visiting it, when I will take note of some pictures to which your attention may be drawn in such a way as you deem desirable.

The amount of hot air admitted in front of the pictures at certain seasons is so great in my observation that a spectator cannot remain before the picture. have personal experience.

The process of desiccation may not be rapid, and will be more rapid in some pictures than in others, but I am strongly impressed with the conviction that the system in force is prejudicial, and mainly so from the position of the perforated gratings, by which so much heated air is admitted in such volumes at once.

If my remarks have the effect of drawing your attention, that of the Inspector General of Art, to the matter, and if my impressions be shown to be incorrect by the opinion of any impartial person and one acquainted professionally with the treatment of pictures I shall be very glad.

Rt. Hon. Robert Lowe, M.P.

I am, &c.  
(Signed) M. W. RIDLEY.

DEAR SIR,

I HAVE taken the earliest opportunity of visiting the South Kensington Museum, and did so yesterday. I trouble you with the catalogues of the Vernon and Sheepshanks and Ellison collections, and on the margin of each I have briefly drawn attention to the condition of many pictures as I notice them. I very much regret that, as far as I am capable of judging, my previous conviction of the danger of destruction to which many pictures there placed are exposed should be, by my visit of yesterday, confirmed. Had deterioration been evident merely in one or two cases, less importance might have been attached to such an occurrence, but I think no impartial person examining the pictures in those collections could refuse to admit that the condition of those I have marked is perilous more or less, and they are many in number. Various causes combine I think to prejudice them, and the admission of so large a quantity of heat is in my opinion unquestionably one powerful cause, but gas, breath, and dust are all assistants, and I entertain grave doubts whether any collection of pictures would long bear the admission of the public at night in a building such as that now at South Kensington under similar circumstances.

Many of those pictures in the two collections alluded to are painted more or less in those vehicles more easily affected by heat; some of them are not so painted, and I readily admit that there are some pictures now deposited there which are at this time in very good condition, but very many are very much deteriorated within a few years, and since I have known them.

Pictures painted as many of those I have marked as "affected" in the margin will not bear strong heat or sun to act without injuring them.

These pictures are undergoing the same process which has destroyed a portrait of William IV. now in the Bodleian Gallery at Oxford.

Of that picture the Keeper not long since said to me "You may almost hear the picture hiss." I would draw this picture especially to your notice at any favourable moment.

Some of Sir Thos. Lawrence's pictures will not bear to be hung continuously even above an ordinary fireplace. I have an instance of that in a full length portrait by him in my possession in London.

With respect to the great bulk of the pictures in the long gallery I have merely noted the two Lawrences, being aware of the age and material in which many of them are painted, and of their previous condition; but I would desire especially to draw your attention to the condition of the Three Graces by Sir Joshua, and my observation on the surface of a *portion* of that picture.

I send you the catalogues thinking this the more convenient form for your reference. I can state that I am alone answerable for any remark—that I consulted no one; that the impressions I had on the subject forced me to make the few observations I did, not in a censorious spirit, or with desire to cast reflection on the administration of the galleries. I very much regret my impressions should be strengthened by what I have since had opportunity of observing.

I have referred to the report of the Commission of 1859 on lighting picture galleries by gas, vol. 15, page 543.

It is not very conclusive to my mind, but I cannot find that any evidence taken before that Commission is printed, so cannot refer to the grounds on which that Commission came to a conclusion.

Let me say in conclusion that I hope such inquiry as you may think well to institute may prove my fears to be groundless.

The only suggestion I would venture to offer would be this, that if you invite opinion, it should be a practical and professional opinion, entirely free from and unbiased by academic influence.

Various pictures in the collection of Mr. Allnutt lately deceased, and in course of sale at Christie's at the moment of my writing, have been notoriously subjected to great heat, and have suffered evidently from the treatment.

I am, &c.

(Signed) M. W. RIDLEY.

Right Hon. Robert Lowe, M.P.

June 17, 1865.  
Letters of Sir  
M. W. Ridley,  
relative to  
alleged dete-  
rioration of  
pictures at  
South Kensing-  
ton.

Memorandum  
by Mr. Redgrave,  
R.A., on the fore-  
going Corre-  
spondence, &c., on  
the Condition of  
the Pictures at  
South Kensing-  
ton.

(2.) MEMORANDUM by Mr. R. REDGRAVE, R.A., relative to the foregoing  
LETTERS of Sir M. W. RIDLEY, and to the CONDITION of the  
PICTURES in the SOUTH KENSINGTON MUSEUM.

My attention has been directed to a correspondence consisting of two letters from Sir M. W. Ridley, Bart., M.P., accompanied by two marked catalogues, containing statements as to the condition of the British pictures in the galleries at South Kensington, which statements seem to resolve themselves under the following heads :

First, that pictures generally suffer from heat, gas, breath, and dust; that many of those at Kensington are painted in perishable vehicles; and that such pictures will not bear strong heat or sun to act without injuring them.

Secondly, that "the system in force at South Kensington is prejudicial, mainly from the position of the perforated gratings by which so much heated air is admitted in such volumes at once." "The amount of hot air admitted in front of the pictures at certain seasons being so great that a spectator cannot remain before the picture," and that in his (Sir M. W. Ridley's) observations, certain pictures had suffered from the admission of hot air through perforated trellis immediately below them, "since their removal from Marlborough House;" that certain pictures marked by him as "affected" in the transmitted catalogues "are in danger of destruction," undergoing the same process which has destroyed a portrait of William IV. in the Bodleian at Oxford, of which the keeper said to Sir M. W. Ridley not long ago, "You may almost hear the pictures hiss."

Thirdly, that he entertains grave doubts whether any collection of pictures would long bear the admission of the public at night in any such building as that now at South Kensington.

As to the first head Sir M. W. Ridley's views are correct, but not very original. It is somewhat trite to remark that pictures suffer from the causes enumerated. That all pictures from the moment of their completion begin to decay is too well known to need further comment, since whether in churches, in palaces, in public galleries, or even in private residences—as, indeed, Sir Matthew allows in respect to a painting in his own house by Lawrence, whose works are certainly not among those which from the pigments employed and the mode of execution are to be classed as most dangerous—all pictures are progressing to decay. The true question to be raised (and this will speedily be entered upon) is whether every possible attention is given to protect them from the destroying influences named—such as heat, gas, breath, &c. Nor were we unaware that many pictures at South Kensington are painted in perishable vehicles, and that such pictures will not bear strong heat or sun to act without injuring them. This also is only too well known. Many of the pictures by Sir Joshua Reynolds began to perish in his own lifetime, as his pupil and biographer Northcote remarks, in various places in his biography of the painter. Indeed, the truth was amply set forth in the very catalogue marked and transmitted with the letters, and reference was made to some of the pictures in the Sheepshanks' collection especially set forth in the marked catalogues as affected or unsound. The quotation inserted below, wherein "the dilapidation and decay" of some and "the fearful disruption of other pictures," is stated, refers to the state of these works when received from the donor, and as the catalogue, of which it formed a part, was, with this description of the state of the pictures submitted to Mr. Sheepshanks, it is clear that he did not dissent from its statements as to the condition of the pictures when removed from his private residence.

The following is the passage alluded to :—

" Before concluding these remarks on the oil pictures, it may be proper to notice those few among them which show evident signs of dilapidation and decay, since such may lead to the false inference that British pictures are not painted in a manner to insure that permanency that was attained by the old masters in their works.

" It has been supposed that the vehicle or medium used by our painters is an unsafe one, and that this is the cause of the changes that are taking place; but this is not the case. It is now well known that most of the mischief to our pictures has resulted from the use of bituminous pigments, such as mummy, asphaltum, &c., and which is now entirely discontinued.

" These pitchy pigments from their very nature never harden, but retain a

tendency to fluidity from heat and to contract and expand under alternations of temperature, unlike the metallic and earthy pigments which mingled with the oils and resins of the painter's vehicle, become harder and drier by age and exposure. Unfortunately these bituminous pigments were very tempting to the painter, forming the coolest and most transparent browns; and hence from the time of Sir Joshua Reynolds, until within the last 20 years they were much used for the luminous shadows, and even in the solid lights by many painters. Pictures so painted often remain apparently sound, and little outward change is visible until it becomes necessary to varnish them, when the soft bituminous layer yields to the strong contraction of the varnish and a fearful disruption takes place. This result was seen in the "Portia and Bassanio" of Newton, No. 166, and in the "Duncan Gray" by Wilkie, No. 226.

"In all cases the evils arising from the use of asphaltum were greatly increased when the successive paintings were too hastily applied ere the previous one had had time to dry. Wilkie is known to have so used it on the "Duncan Gray." The picture was nearly completed in a solid manner of execution, and silvery tone, when he became enamoured of the rich juicy manner of Ostade, and sought rapidly to change the appearance of his work by successive paintings into asphaltum, each succeeding colour being applied as rapidly as the under one would film over, and hence the much to be regretted dilapidation of the picture. As he was pleased with the expression of the principal female head, he forbore to touch it; and this and some few other parts remain quite uninjured, while the hands of the father, much of the figure of "Duncan Gray," and almost all the back-ground were probably, enriched greatly for a short time, but seriously injured for futurity by these re-paintings. One of the landscapes by Mulready, No. 135, is also somewhat cracked from the use of asphaltum, but the companion picture painted shortly afterwards is in the soundest state; and as he entirely gave up the use of this dangerous pigment, all the other works are in beautiful preservation, and with every prospect of being as durable as the best pictures of the Flemish and Dutch schools. Moreover, bituminous colours have of late years been entirely shunned by all our best artists."

But I repeat, the real question is not whether these pictures are decaying—since it is too well known that being painted in unsound pigments the seeds of decay are in many of them—but whether the galleries at South Kensington are unfitted for pictures, and whether the utmost care is or is not given to preserve them.

As to the second head. It is therein asserted that the heated air is admitted in volumes through perforated gratings in front of the pictures; but the rooms in which the pictures from Marlborough House have been placed ever since their removal to Kensington, are heated solely by hot-water pipes open throughout their whole length to the room, and kept at an even temperature.

Moreover the subjoined document (Appendix p. 97.) will prove that most of the pictures marked by Sir Matthew were well known to be in an unsatisfactory state when removed to South Kensington,—many no doubt, even while in Mr. Vernon's possession,—and will go far to remove the imputation that they have suffered while at Kensington from want of care either on the part of the officers of the Department of Art or of the director or keeper of the National Gallery in whose charge they really are.

While agreeing with Sir M. W. Ridley that many pictures are "affected," and many in a dilapidated state, I also know that the sight of pictures, such as those by Reynolds, Hilton, Wilkie, &c., lead the public *erroneously* to suppose that they are neglected rather than wisely left from being prematurely dealt with. Even the National Gallery attendants were deceived as to the progress of injuries. These men, who narrowly watch the pictures, reported that the cracks in the "Holy Family," by Reynolds (No. 78), and "The Last Supper" by West (No. 315), were progressing; it was therefore determined to take photographs of a large size of the principal cracks, and that Sir C. Eastlake and myself should from time to time compare them with the cracks on the picture. This has been done frequently, yet no perceptible progress during the last three years has been ascertained. Copies of these photographs are appended. And this leads me to show the care taken to guard the pictures from undue heat. Ever since the opening of the galleries, thermometers have been hung in various parts of each room, at various heights, and even on the frames of the pictures. It is the duty of an officer to visit and inspect these thermometers

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continuously during the day, and the evening, and to regulate the temperature, if it rises or falls unduly, his orders being to keep it as near 60° as possible. The state of these thermometers taken three times during the day, and once by the police who are constantly in the building during the night, is registered.

A table of the registry is appended, and when it is seen that on the part of the walls occupied by pictures, the heights have never been greater than 79° for the Vernon Galleries, and 83° for the Sheepshanks Galleries, and these averages in the summer quarter and when there was no artificial heat, it is rather a strong statement that a spectator "cannot stand before a picture," or that the heat is such as to "make the pictures hiss."

With respect, more particularly, to the Sheepshanks Collection, which alone are in my charge, it has already been shown that many works when received were suffering greatly from the use of bituminous pigments. Photographs of several were taken to show their state at that time, one or two of those referred to are appended to this report.

From these it will be seen not only that their state was well understood, but that some, which were in the worst state, have been preserved from further decay.

In 1860 (see the Report of the Department of that date) Mr. Mulready, named in Mr. Sheepshanks' deed of gift as referee, was made aware that pictures were endangered from too close an inspection, from accidental sneezings, acrid splutterings in speaking, breath, &c.; and since then all the most delicate have been placed under glass, both as a security against the above injuries as well as against dust and fingering.

As objections had been raised to lighting pictures by gas, a commission was named, of which three of our most eminent chemists, Messrs. Faraday, Hofmann, and Tyndall were members, to consider the question; and the report they unanimously agreed to after careful examination of tests of the effects of lighting, the range of the thermometers, &c., is most conclusive as to the perfect safety of the practice as carried out at South Kensington. (*For a copy of this report see page 88 of Appendix E.*)

In 1861 vague complaints were again made that the pictures were suffering from gas, heat, &c. In my report of that year, consequent on these complaints, after enumerating the steps which had been successfully taken to prevent the progress of injury in certain of the faultily painted pictures, I proceed to state that other equally faultily painted pictures, wherein asphaltum has been used as a pigment, or maglyp much too freely as a vehicle, must be expected to progress in decay, and that no known means under any kind of care will entirely preserve them, either in public galleries or private collections. A table, however, accompanied that report, showing that on no occasion during the past year had the thermometer at any part of the surface of the paintings ranged higher than 72°, while subsequent records (*see page 99*) show that a like equality has continued to be maintained. On some further representations as to danger from fire, the same three eminent chemists were again requested to examine these galleries, and on this occasion each reported individually. Mr. Faraday, in the body of his report, says: "I have no chance to make in any of the conclusions contained in my former report; but, on looking at the Sheepshanks' Gallery at this time as an experimental attempt to light pictures by gas, am still of opinion that the process there carried out fulfils the condition of effectually illuminating the pictures and at the same time removing the products of combustion." Professor Tyndall says: "I have this day re-perused the report on the illumination of the picture galleries of the South Kensington Museum, bearing date 20th July 1859, and beg to state that I see no reason to deviate from the opinion embodied in that report." While Dr. Hofmann, after testing by thermometrical observations the state of the galleries, concludes his report by saying, "Having thus carefully reconsidered the question addressed to me, I do not see any reason to alter or qualify the opinions expressed in the report alluded to (that of July 1859)."

As to the third division of the statements in the letter, it will be seen that the reports of the Commission on lighting pictures by gas, have established, that, as used at Kensington it is rather a benefit to the pictures than otherwise, by promoting the due ventilation of the rooms. The building for the Sheepshanks Collection is of a most substantial construction, solid and fireproof. The skylights in that part are double, the lower one being of ground glass, and between

the two a moveable holland blind, always, when necessary, drawn down to exclude the sun. The floors of Minton's hard-pressed tiles, the best material to prevent dust, are carefully swept every morning and thoroughly washed once a week.

The admission of air is far from a public road, to avoid dust, and the ventilation of a most perfect kind (the Vernon Galleries are equally substantial, except that the roof has but one skylight and is of a more temporary character). The delicate pictures are carefully protected by glass from dust and breath; the others dusted daily, and the surface of each wiped periodically.\* It is therefore difficult to understand why, under such conditions, the pictures should suffer from exhibition, or how they could be shown with greater attention to their preservation—why, indeed, from the daily and hourly attention given to them, they are not safer, and their condition more ensured than could be in any private residence?

I cannot refrain from remarking, in conclusion, that while the condition and preservation of the pictures should be open to every inquiry, conducted by persons professionally and practically competent, and of unbiased judgment, it was somewhat particular to stipulate against "Academic influence." The pictures of Mr. Sheepshanks were by him offered to the nation through a member of the Royal Academy, and such confidence had the donor in their judgment and discretion that he expressly stipulated in his deed of gift that some *one* member of that body should be the sole and undivided authority for the conservation and repair of the pictures it included. Mr. Mulready being named first, after him myself, and failing both of us, some *one* member of the Royal Academy. Turner, a member of the Royal Academy, gave all his pictures to the nation, and certainly would not have excluded "Academic influence." Moreover, at least seven-eighths of the whole of the pictures in the Vernon and Sheepshanks† collections, and certainly all the most important are by members of the Academy, and it would seem that no body of men can have so strong and direct an interest in their safety and preservation; at the same time that they are the most competent to form a just opinion on the subject.

(Signed) RICHARD REDGRAVE.

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by Mr. Redgrave,  
R.A., on the fore-  
going corres-  
pondence, &c., on  
the condition of  
the pictures at  
South Kensing-  
ton.

June 25, 1863.

(3.) NOTES by Sir M. W. RIDLEY, and EXTRACTS from a REPORT by Sir C. L. EASTLAKE, R.A., Mr. J. C. ROBINSON, and Mr. R. REDGRAVE, R.A., on certain PICTURES in the VERNON and TURNER GALLERIES.

Notes on certain  
pictures at  
South Kensing-  
ton.

The notes made by Sir M. W. Ridley on the pictures in the Vernon and Turner Galleries are in italics.

Those in roman type are extracts from a report made after examination of the pictures by Sir C. Eastlake, director of the National Gallery, Mr. Robinson, one of the art referees of the South Kensington Museum, and Mr. Redgrave, the inspector-general for art, when the pictures were transferred from Marlborough House to South Kensington in November 1859.

No. 340 Calcott.

*Very smutty.*

"Good state, but dirty and oil change in sky."

No. 343 Calcott.

*Going.*

"Clotted and corrugated in bituminous pigments in trees."

No. 345 Calcott.

*Not in good condition, requires attention.*

"Wire cracked, especially by stretcher and in laky coat of shrimper, covered with a very changed varnish."

\* This statement must be distinctly understood to relate solely to the pictures given by Mr. Sheepshanks and the others hung in the four rooms of the Sheepshanks' Gallery. Those given by Mr. Vernon, together with those removed from the National Gallery, are under the charge of the Director of the National Gallery, who is solely responsible for their care and preservation.

† Sheepshanks, 34 out of 233; Vernon, 47 out of 462; general average, about seven-eighths.

Notes on certain pictures at South Kensington.

No. 346 Callcott.

*In a very dangerous state and neither maglyp nor asphalte traceable.*

“ Wire cracked, especially on the right of sky, places scaling, and the whole surface very dirty and apparent vehicle changes, curdling also in near water.”

No. 347 Callcott.

*Condition doubtful.*

“ Sound.”

No. 437 Danby.

*Not to be trusted to much heat.*

“ Sound, but rather dingy in parts of the sky.”

No. 398 Eastlake.

*Evident.*

“ Sound, dusky changes in vertical streaks on face.”

No. 361 Etty.

*Very evident.*

“ Pigment changes on face, clotting on back-ground.”

No. 366 Etty.

*In rapid course of destruction.*

“ Flesh dirty and much bitumen. Cracked in all the shadows of flesh, apparently going to ruin.”

No. 453 Fraser.

“ Tolerably sound.”

No. 451 Goodall.

*Beginning.*

“ Good state.”

No. 424 Hart.

*Vehicle.*

“ Bitumen cracked all over, flowing and in a state of utter ruin.”

No. 337 Hilton.

*This picture is not a soundly painted picture whatever its state before it came to South Kensington: it is in rapid state of destruction. It is just one of those pictures which heat will act upon prejudicially.*

“ Cracked in parts, flowing, much vehicle changed.”

No. 389 Jones.

*Evident.*

“ Good state.”

No. 390 Jones.

*Evident.*

“ Sound.”

No. 441 Lance.

“ Very much vehicle cracked in back-ground and lower right corner.”

No. 408 Landseer.

*Not apparently painted in unsound vehicle.*

“ Vehicle cracked above back of female, W cracked also.”

No. 611 Landseer.

*Generally affected.*

“ Changed on parts of the flesh, vehicle cracked in centre in brown darks.”

No. 603 Landseer.

*Clearly not safe.*

“ Good state.”

No. 604 Landseer.

*Not safe.*

“ Good state.”

No. 440 Lane.

*Evident.*

“ Good state.”

No. 136 Lawrence.

*Very bad.*

“ Very brown surface, badly bitumen cracked, and cracked at stretcher.”

## No. 142 Lawrence.

*Affected same as 136 but not so bad.**" Very much wire cracked and bitumen cracked especially on back-ground, apparently going on near the head."*

Notes on certain pictures at South Kensington.

## No. 422 Macrise.

*Perceptible along the joining of the canvas, especially to the left of the picture. Macrise's colours are generally fast.**" Good state, horizontal joint of canvas showing above."*

## No. 394 Mulready.

*Traceable.**" Good state, vehicle changes above dancing figure."*

## No. 79 Reynolds.

*Notice the efflorescence salt or fungus on the figure of Mrs. Beresford. This efflorescence has remained on that figure ever since February 7, 1863, to my knowledge, and I saw it there at that time. (Signed) M. W. Ridley.**" Dark varnish in patches, wire cracked in parts tending to left, badly vehicle cracked in numerous parts."*

## No. 383 Simson.

*Affected.**" Good state."*

## No. 350 Thomson.

*Much affected.**" Vehicle cracks all over (lifting)."*

## No. 385 Ward.

*Very bad state.**" Very much cracked in centre, and covered with a viscid brown stain."*

## No. 426 Webster.

*Decided.**" Sound."*

## No. 315 West.

*Affected.**" Much vehicle cracked,"*

## No. 99 Wilkie.

*It seems as though a portion of the colour may be shed ere long on the left of the picture.**" Cracking in numerous places quite down to light ground."*

## No. 123 Williams Edward.

*Affected.**" Bitumen cracked all over."*

## No. 353 Newton.

*Very bad.**" Bitumen cracks in all the dark browns and in woman's petticoat."*

## APPENDIX G.

RETURNS showing the MAXIMUM VARIATIONS in the THERMOMETRIC READINGS in the PICTURE GALLERIES at the SOUTH KENSINGTON MUSEUM.

(1.) TEMPERATURE for the Year ending 31st of December 1861 in Galleries containing the National Gallery Pictures.

## Winter quarter.

The highest temperature occurred on the evening of March 20th, thermometer reading 66°, outside temperature 55°. The lowest was on the morning of the 20th January, thermometer reading 43°, outside temperature 39°.

## Spring quarter.

The highest temperature occurred on the afternoon of May 26th, thermometer reading 71°, outside temperature 67°. The lowest was on the morning of April 24th, thermometer reading 53°, outside temperature 35°.

Returns of  
Temperature, &c.

The highest was on the evening of July 3rd, thermometer reading  $72^{\circ}$ , outside temperature  $71^{\circ}$ . The lowest on the morning of September 11th, thermometer reading  $57^{\circ}$ , outside temperature  $56^{\circ}$ .

## Autumn quarter.

The highest was on Monday October 1st, thermometer reading  $63^{\circ}$ , outside temperature  $43^{\circ}$ . The lowest was on Wednesday, November 25th, 1860, the boilers being out of repair, the thermometer reading  $32^{\circ}$ , outside temperature  $26^{\circ}$ .

## AVERAGE.

## Long Gallery of British Paintings.

Average of gallery	-	-	-	-	-	$58^{\circ}$
" bottom of paintings	-	-	-	-	-	$61^{\circ}$
" top of paintings	-	-	-	-	-	$60^{\circ}$

## Vernon Rooms.

Average of rooms	-	-	-	-	-	$59^{\circ}$
" bottom of paintings	-	-	-	-	-	$61^{\circ}$
" top of paintings	-	-	-	-	-	$60^{\circ}$

## Turner Rooms.

Average of rooms	-	-	-	-	-	$59^{\circ}$
" bottom of paintings	-	-	-	-	-	$61^{\circ}$
" top of paintings	-	-	-	-	-	$60^{\circ}$

(Signed) G. KING,

Attendant on Ventilation.

## 2. TABLE showing the HIGHEST and LOWEST TEMPERATURE and the Monthly and Yearly Average in the PICTURE GALLERIES for 1862-63.

HIGHEST TEMPERATURE.				LOWEST TEMPERATURE.				AVERAGE FOR THE MONTH.													Ave for Ye
Winter quarter.	Spring quarter.	Summer quarter.	Autumn quarter.	Winter quarter.	Spring quarter.	Summer quarter.	Autumn quarter.	A.D.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	

## SHEEPSHANKS.

°	°	°	°	°	°	°	°	1861	° See Table 1 (suprà).	°	°	°	°	°	°	°	°	°	°	°	°
68	70	79	79	46	47	53	49	1862	52	55	56	56	61	64	65	66	63	60	53	56	53
68	68	—	—	40	48	—	—	1863	55	56	56	60	59	—	—	—	—	—	—	—	—

## TURNER.

68	70	79	79	46	47	53	49	1861	° See Table 1 (suprà).	°	°	°	°	°	°	°	°	°	°	°	°
—	—	—	—	—	—	—	—	1862	58	58	59	58	62	64	66	66	63	60	56	57	57
68	—	—	—	40	48	—	—	1863	57	57	57	59	58	—	—	—	—	—	—	—	—

## VERNON.

68	70	79	79	46	47	53	49	1861	° See Table 1 (suprà).	°	°	°	°	°	°	°	°	°	°	°	°
67	60	—	—	48	52	—	—	1862	59	60	61	58	61	62	63	64	65	62	61	57	59
68	—	—	—	—	—	—	—	1863	59	60	59	59	58	—	—	—	—	—	—	—	—

## LONG GALLERY.

68	70	79	79	46	47	53	49	1861	° See Table 1 (suprà).	°	°	°	°	°	°	°	°	°	°	°	°
67	65	—	—	50	44	—	—	1862	59	60	61	58	61	62	64	64	62	60	59	59	61
68	—	—	—	—	—	—	—	1863	59	60	59	59	58	—	—	—	—	—	—	—	—

(Signed) G. KING,  
Deputy Foreman of Works and Attendant on Ventilation.

(3.) TABLE showing the HIGHEST and LOWEST TEMPERATURE and the Monthly and Yearly Average in the SHEEPSHANKS GALLERY from 1858 to 1861 inclusivé.

HIGHEST TEMPERATURE.				LOWEST TEMPERATURE.				AVERAGE FOR THE MONTH.													
Winter quarter.	Spring quarter.	Summer quarter.	Autumn quarter.	Winter quarter.	Spring quarter.	Summer quarter.	Autumn quarter.	A.D.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Average for the Year.
62°	66°	83°	73°	37°	44°	54°	52°	1858	56°	50°	53°	57°	61°	69°	66°	65°	61°	58°	56°	58°	
60°	77°	80°	77°	47°	51°	58°	58°	1859	55°	56°	58°	66°	64°	70°	73°	69°	62°	65°	57°	57°	62°
63°	67°	71°	69°	38°	46°	57°	48°	1860	54°	56°	58°	56°	63°	62°	67°	59°	59°	55°	55°	54°	59°
61°	62°	71°	77°	46°	46°	43°	58°	1861	52°	53°	53°	55°	66°	67°	69°	70°	65°	62°	53°	54°	59°

Time of Registry, 10 a.m. to 1 p.m. & 3 p.m.

(Signed) B. L. SPACKMAN, Serjt. R.E.

(4.) GREATEST VARIATIONS in the Thermometric Readings, in Rooms occupied by the National Gallery Paintings, during the years 1859 to 1865.

(Referred to in Mr. R. N. Wornum's evidence, Question 227.)

Long Gallery.				Vernon Gallery.				Turner Gallery.			
Date.	Highest.	Lowest.	Variation.	Date.	Highest.	Lowest.	Variation.	Date.	Highest.	Lowest.	Variation.
1859. Decr. 22nd	63	48	15	1859. Decr. 19th	66	40	26*	1859. Decr. 19th	57	39	18
1860. Jany. 23rd	63	50	13	1860. Jany. 6th	65	56	9	1860. Jany. 5th	64	55	9
Feby. 18th	63	51	12	Feby. 17th	69	52	17	Feby. 1st-	64	49	15
Novr. 26th	61	48	13	Novr. 26th	64	51	13	Novr. 26th	63	49	14
Decr. 27th	53	41	12	Dec. 24th	52	37	15	Decr. 26th	63	40	23
1861. Jany. 16th -	59	46	13	1861. Jany. 16th	64	48	16	1861. Jany. 16th	63	48	15
1862. Novr. 5th -	62	54	8	1862. Novr. 15th	61	51	10	1862. Novr. 15th	61	50	11
Decr. 6th -	67	60	7	Decr. 20th	64	57	7	Decr. 20th	63	54	9
1863. Jany. 17th	63	55	8	1863. Jany. 12th	62	51	11	1863. Jany. 12th	63	50	13
Feby. 16th	64	59	5	Feby. 21st	64	54	10	Feby. 16th	64	54	10
Novr. 30th	58	51	7	Novr. 30th	59	48	11	Novr. 30th	59	46	13
Decr. 1st -	61	55	6	Decr. 1st -	64	52	12	Decr. 28th	62	47	15
1864. Jany. 5th -	60	54	6	1864. Jany. 3rd	59	43	16	1864. Jany. 4th	60	41	19
Feby. 22nd	58	51	7	Feby. 18th	58	45	13	Feby. 9th	60	43	17
Novr. 19th	64	58	6	Novr. 19th	67	55	12	Novr. 22nd	65	50	15
Decr. 7th -	61	51	10	Decr. 19th	65	53	12	Decr. 19th	64	47	17
1865. Jany. 10th	66	59	7	1865. Jany. 21st	63	53	10	1865. Jany. 30th	64	46	18
Feby. 16th -	62	52	10	Feby. 18th	63	49	14	Feby. 13th	59	45	14

\* The great variation on the 19th Decr. 1859, was owing to the boilers being out of repair, and about the middle of the day the fires were relighted, and the gas was burning at the same time.

Returns of  
temperature, &c.

(5.) COMPARATIVE STATEMENT showing the Thermometric Readings in Picture Galleries at the South Kensington Museum and at the National Gallery respectively, on the 22d July 1869, at 4 P.M.

South Kensington Museum.				National Gallery.			
Competition	-	-	77°	West Room	-	-	79°
Ellison	-	-	77	Turner, 1	-	-	78
East, 1	-	-	79	2	-	-	78
" 2	-	-	78	Flemish, 1	-	-	79
" 3	-	-	79	2	-	-	77
Raphael	-	-	79	Italian, 1	-	-	77
Turner, 1	-	-	81	2	-	-	76
" 2	-	-	79	French, 1	-	-	76
" 3	-	-	81	2	-	-	76
Vernon, 1	-	-	79	East	-	-	78
" 2	-	-	80				
" 3	-	-	80				
Sheepshanks, 1	-	-	79				
" 2	-	-	79				
" 3	-	-	81				
" 4	-	-	80				

*Note.—A tabular statement of the diurnal variations of temperature and of the maximum, minimum, and mean temperature, in six of the galleries in the South Kensington Museum, as compared with the variations of the Standard thermometer out of doors, during the years 1867 to 1870, is given in the Report by Capt. Festing, R.E., at page 79, Appendix B.*

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